VOL. XXXII NEW YORK—THURSDAY, JANUARY 28, 1915—CHICAGO No. 4

Main aisle, looking from the south in the Coliseum, one of the buildings in which the Chicago automobile show is being held

Closing the National Show Circuit

Six New Eights at Chicago, Four Being on Chassis—11 Car Firms Not at New York

CHICAGO, ILL., Jan. 23—Opening time at 2 p. m. today found the 302 exhibitors at the Fifteenth Annual Automobile Show in the Coliseum, First Regiment Armory, Coliseum Annex and Greer building, ready to receive the influx of visitors which seemed the largest on any opening day in the annual exhibition's 15-year history.

Developments are always seen at the Chicago show which have not made their appearance at New York or other previous exhibitions on the national show circuit. This year proved to be no exception to the rule, eleven car manufacturers, eight of which are gasoline and three electrics, are exhibiting in the metropolis of the central west who did not show at New York. In addition to these there are forty-nine accessory makers whose wares have not previously appeared in the exhibitions. Besides these new makers among the names of those exhibiting there are several others who waited for the Chicago show to make announcements which are of prime importance.

CENSUS OF THE SHOW

Total Makes of Cars	**88**
Gasoline Car Makes	**80**
Electric Car Makes	**8**

CHASSIS

Four-Cylinder	**19**
Four-Cylinder Sleeve	**4**
Six-Cylinder	**18**
Eight-Cylinder	**3**

BODY TYPES

Touring Cars	**122**
Roadsters	**42**
Limousines	**11**
Coupés	**6**
Raceabouts	**4**
Sedans	**7**
Cabriolets	**5**
Broughams	**3**

GASOLINE CARS

Four-Cylinder	**120**
Four-Cylinder Sleeve	**15**
Six-Cylinder	**109**
Six-Cylinder Sleeve	**1**
Eight-Cylinder	**11**

ELECTRIC CARS

Coupés	**20**
Roadsters	**2**
Coupelets	**2**
Chassis	**1**

Four new eights make their first appearance here. These are the Cole, Ross, Regal and Abbott. In addition there are two new eight-cylinder motors exhibited by engine builders. These are Buda and Davis. The Massnick-Phipps Mfg. Co. is also showing the Perkins eight exhibited at New York. Three new sixes are also on view for the first time; these are the Imperial, the Ogren and the Halladay shown on motor row. Altogether, there are nine new car models, the products of eight makers, which are either at the Coliseum or in private exhibitions. These are the Franklin, Ross eight, Regal eight, Regal small four, Imperial six, Cole eight, Shaw taxicab, Halladay six and Ogren six. In addition to these the Moline company is showing a new four-cylinder motor which is the smallest Knight that has ever

Partial view of the electric car exhibits in the First Regiment Armory, which is one of the buildings housing the Chicago show

been announced in this country and which will form the power plant of a new car to sell for $1,475. In one instance, the Chandler, an important price reduction has been announced. This is a cut of $300, from $1,595 to $1,295.

The general arrangement of the show buildings is the same as in former years, the car exhibits being on the main floor of the Coliseum and Annex. The main floor of the Greer building, which is connected directly by a doorway to the floor of the Coliseum, is also utilized. From the Greer building there is an exit which leads to an alley through which the visitor must pass to enter the First Regiment Armory. The alley is covered with canvas, bringing the entire exhibit under a common roof in that it is not necessary to pass through an unsheltered area to get from one building to another. In order to have all the parts of the show equally attended it is necessary to pass through the Greer building in going from the Armory to the Coliseum.

Accessories on Balcony

The accessory exhibitors are disposed about the balcony of the Coliseum, in the upper floor of the Annex, the balcony of the Armory and the Annex basement. There are 215 accessory exhibitors housed in these spaces. This takes up all the available space in these buildings and, in fact, many were unable to secure room in which to exhibit their wares.

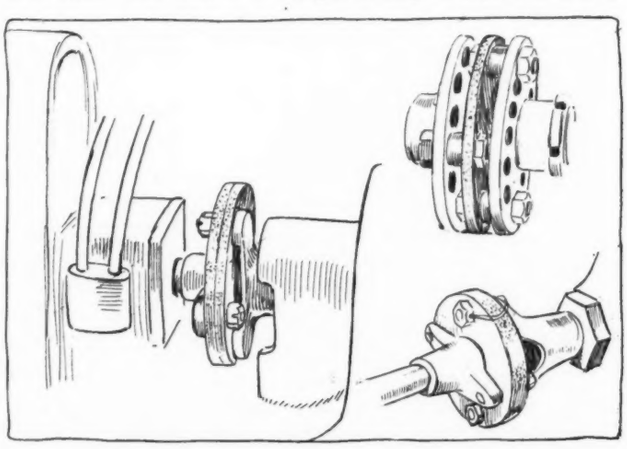
In a decorative way the show is one of the most successful ever held in Chicago. The scheme is that of an English garden with white picket fences separating the exhibitors spaces and a touch of color is given by the use of twining roses. Overhead the decorative scheme is carried out by having the ceiling painted like the beams of a vast pergola with the blue sky showing between. On the whole the exhibits are tasteful in that they are sufficiently subdued to form a suitable background for the color scheme of the cars. The show committee consists of Sam Miles, Col. George Pope, H. O. Smith and Wilfred Leland.

Comparing the Chicago show with that of New York, there are seven more car exhibitors, or a total of eighty-eight. In addition to this difference of figures some of the exhibitors have more space and hence more cars on view, than they did in New York. For example: In four-cylinder models there are 122 here as against ninety-six in New York. The sixes are nearly even, the figures being Chicago 109, New York 105. As regards eights there is a difference of four in favor of Chicago, New York having seven. As at New York, the four still holds its supremacy as shown by the figures.

122 Touring Cars

In body work the touring car naturally leads. There are 122 of these, with roadsters second, to the number of forty-two. The remainder is made up by limousines, sedans, coupés, cabriolets and other special types. Those cars which are at Chicago, but which were not exhibited at New York are Abbott, Austin, Glide, Buckeye, Crow, Elkhart, Paterson and Vixen for the gasoline cars, and the American, Milburn and Woods electric. The American is the product of the consolidation of the Broc, Borland and Argo and the Milburn is a new make put out by a prominent body and carriage maker who has recently entered this field.

The eights at the show are Cadillac, Cole, King, Regal, Detroiter, Remington and Abbott; at the LaSalle Hotel there is the Ross eight and besides these there are the three eights of the motor makers, Buda, Davis and Massnick-Phipps. Of these the Cole, Regal, Abbott and Ross are seen for the first time mounted in the chassis of the companies mentioned. The Buda and Davis are shown as unmounted motors also for the first time. The Cole is a V-eight selling at $1,785 and was



The use of leather disks in magneto couplings as found in several cars at the Chicago show. Left—Overland. Upper right—Jeffery. Lower right—Chandler

described in THE AUTOMOBILE for January 21. The Regal eight is a 2.875 by 4.5 V design mounted on a 112-inch wheelbase selling at $1,250 and has the novel feature of a removable horizontal plate connecting the two sets of cylinder heads, which are detachable. It is fitted with a Bosch-Rushmore flywheel installation.

The Abbott eight makes use of the Perkins motor in a chassis which is a standard Abbott design. The new Ross eight which is making its début in Chicago is the product of the Ross & Young Machine Co., parts makers of Detroit. It sells for $1,350 and has a 3 by 4.5 V motor with silent-chain driven camshaft and thermo-syphon cooling. It is fitted with a starting and lighting outfit operating at 12 volts manufactured by the Ross & Young Co. Other specifications include a multiple-disk clutch, Hotchkiss rear system, 115-inch wheelbase and 34 by 4 tires.

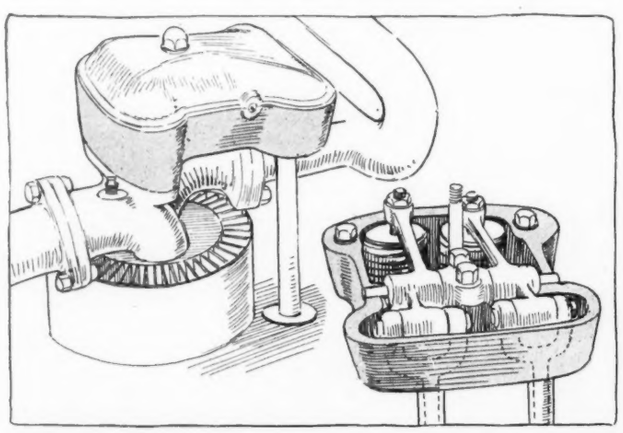
Three New Sixes

The new sixes are the Imperial, Ogren and Halladay, while in addition to these Franklin has announced a new series in which the only changes have been the inclosure of the overhead valves and a roomier body. The Imperial, known as the model 66, has a Continental block 3 by 5 motor, is mounted on a 122-inch wheelbase with 33 by 4 tires and sells in five-passenger touring form for $1,285.

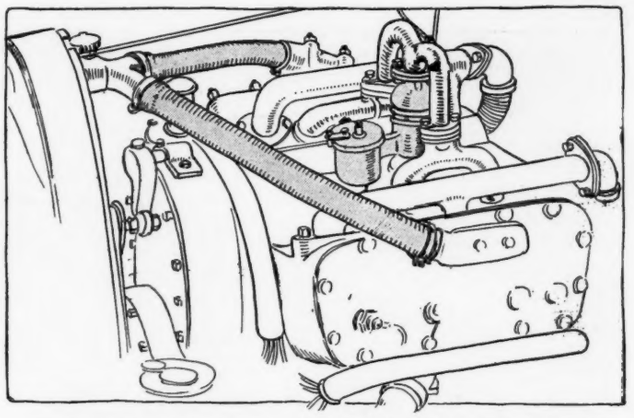
The new Halladay six, which is the product of the Barley Mfg. Co., incorporates a Rutenber power plant which is an L-head block, a disk clutch and a three-speed gearset in a unit, with three-point suspension. It has a floating rear axle and is equipped with a Westinghouse combined ignition, starting and lighting outfit. Gasoline feed is by Stewart vacuum.

The new Moline motor is of more than passing interest as it is the forerunner of the new Moline car which is shortly to be announced and at the same time is the smallest Knight motor so far in America. The new car to be known as the 40 will sell for $1,475 and, while complete details are not as yet available, it is known that the wheelbase will be 118 inches, the clutch a leather-faced cone, the rear axle floating and the tires 34 by 4 inches. The Ogren six is not quite new, having been produced by the Ogren Motor Car Co., of Chicago, during the past year, but it is not familiar to many show visitors. It is a 3.75 by 5.5 L-head job with standard parts throughout and sells for $2,500 in seven-passenger form.

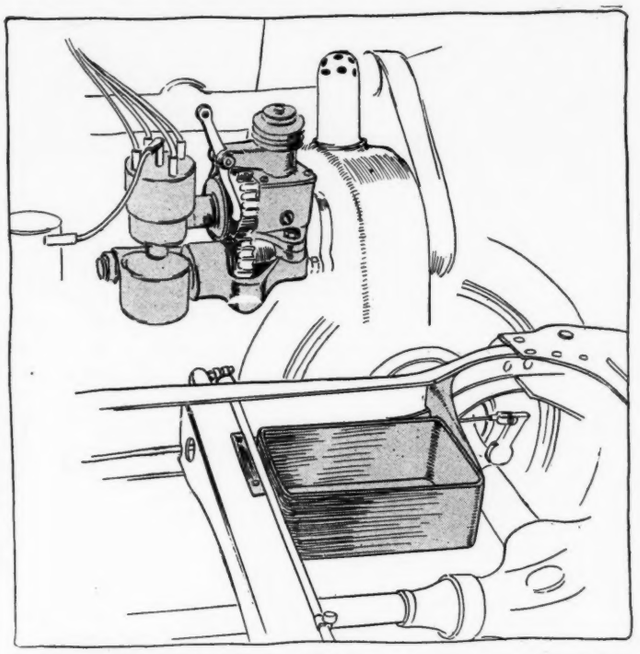
Regal is showing a new four-cylinder car that has a smaller power plant than its previous four which is continued, bringing the Regal line to three models, an eight and two fours. The new four has a 3.375 by 4.75 power plant cast in a block, with the clutch and gearset as a unit. It has cantilever rear springs, a 106-inch wheelbase and 30 by 3.5 tires. It sells at $650 with complete electric equipment, one-man top and a streamline touring body.



Left—New Franklin valve cover. Right—Showing top of box removed. The box is integral with the manifold, the center part of the cover being secured to it by a holding-down bolt



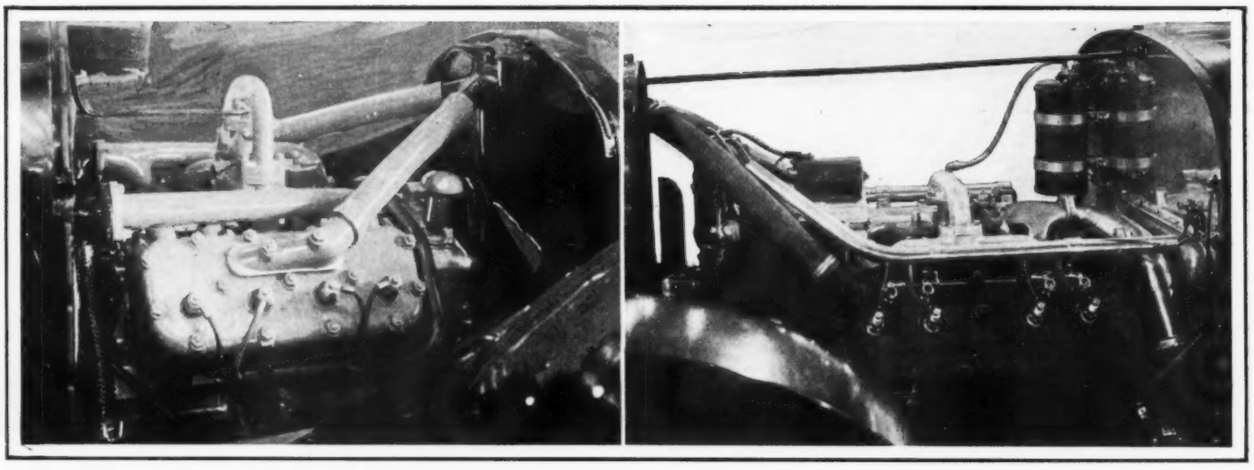
Regal eight-cylinder motor, showing diagonal return water connections between cylinder blocks and radiator. Note accessible carbureter and detachable flexible exhaust lines



Upper—Mitchell ignition distributer and tire pump mounting. Lower—A good example of battery support using a metal box as found on Mitchell cars

The use of polished chassis is showing an increase at Chicago as at New York, nineteen fours, eighteen sixes, three eights and four Knights being shown in this manner, and attracting considerable attention. Others are showing cutaway motors or distinguishing parts of the chassis. The Woods electric has a worm drive running in a glass case. The Hudson six is on a scale as at New York, and accessories firms are employing moving exhibits such as jumping dolls for shock absorbers, etc.

In body work the tendency is to show the stock hues, but Locomobile, Packard, White, Paige, Apperson, Cadillac, Moon, Oakland, Buick, Saxon, Chalmers and Pierce have cars which are painted in striking colors. The inclosed bodies are in all forms and, in connection with these may be mentioned the hinged steering wheel on the Pierce coupé. This differs from the forms used by Cadillac and King in that the wood rim itself hinges on either side rather than whole rim swinging out of the way.



Right side of the new Regal eight-cylinder V motor. View of Cole eight-cylinder motor, which is one of the surprises of the Chicago show

Nine New Cars on Display at Chicago

Cole, Regal, Ross and Abbott Have Eights—Imperial, Halliday and Ogren Sixes—Small Regal and Shaw Taxicab Are Fours—New Motors Shown

EIGHT-cylinder cars constitute the feature of the exhibit at Chicago. There are four new eight-cylinder cars on exhibition in addition to those which were shown at the Grand Central Palace. These are the Cole, the Regal, the Ross, and the Abbott. In addition, three new eight-cylinder motors were shown by engine makers, one of these Davis, another Buda and the third, Perkins. Two new small sixes were on view, the Imperial at the Coliseum, and the Halladay on motor row. New fours in every case are smaller than those the concerns exhibiting them had used previously. The new Moline-Knight is the smallest Knight engine which has appeared in America and the Regal four has a smaller four-cylinder engine.

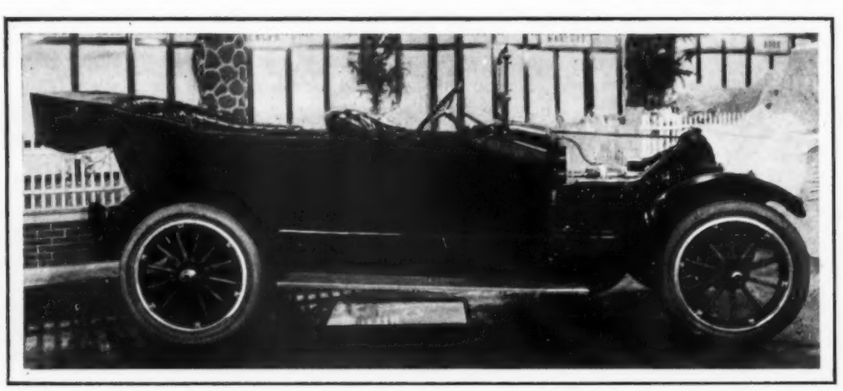
In all there are nine new cars or new models not previously shown, to be seen either at the Coliseum or in private exhibitions. The Franklin company has announced a new series whose only change in design is the inclosing of the overhead valve. In the electric field the only change within the past 2 weeks has been in the announcement of wire wheels as stock or optional equipment on practically every electric.

Price reductions are announced in one instance, the Chandler price being dropped $300.

The Ross Eight

A new car makes its début in eight-cylinder form at the LaSalle Hotel. This is the Ross eight, which is given the name of model A. It is the product of the Ross & Young Machine Co., Detroit, Mich., a concern which long has been making parts for Detroit car manufacturers. Aside from the eight cylinders, the feature of the car is its price, which is $1,350 for the five-passenger touring model, the only body offered at this time. The motor is made by the Ross & Young company.

The cylinders are arranged in a V and are 3 by 4 1-2 inches. The cylinders are cast in L-head blocks of four with the valves on the inner side. The camshaft is driven by a silent chain and thermo-syphon cooling is used. Lubrication is by oil forced to cylinders, crank and camshaft by means of a plunger pump. Ignition is by an Atwater Kent Unisparker having automatic advance with both dry cells and storage batteries as a current source. Fuel is fed to the carbureter from a rear tank by the Stewart vacuum system.



The new Cole eight-cylinder touring car announced at the Chicago show

Starting and lighting is by an electric system of Ross & Youngs' own manufacture. It operates on 12 volts. A multiple disk clutch with cork inserts is used and in unit with the rest of the power plant is a three-speed selective gearset with center control. The unit power plant thus supplied is suspended at three points.

The drive from the propeller shaft and Timken axles is taken through the springs on the Hotchkiss principle. Brakes are 14 by 2 1-4 inches in size, the service brakes being internal, and the emergency brakes external on the

rear wheel drum. The wheelbase is 115 inches, and tires 34 by 4 on Detroit Q.D. rims. Springs are three-quarter elliptic in the rear, and the conventional semi-elliptic in front. The equipment includes the one-man top aside from the regular outfitting. A very clean streamline boat-shaped body is provided.

The Regal Eight

The Regal Motor Car Co., Detroit, is showing two new cars at the Coliseum, the complete Regal line for the coming season being three models, a new eight, a new small four and the larger four. The eight-cylinder car sells in the five-passenger touring form at $1,250. It has a V-type motor, 2 7-8 by 4 1-2 inches and 112-inch wheelbase. Equipment includes, aside from the regular fitment, a one-man top with Jiffy curtains and tire carrier at the rear with an extra rim.

The eight cylinders are cast in two separate blocks of four, being L-head with the valves on the inside. The outside view of the motor is made particularly clean by means of a removable horizontal plate connecting the two sets of cylinder heads which are separately detachable on each block. The electric equipment includes a Bosch-Rushmore generator on the forward left side of the engine with the cranking motor connecting to the flywheel. Ignition is by battery and distributor. Above the plate, connecting the two sides of the V, is the Stewart carbureter which communicates with each block of cylinders through a ram's horn intake to the integral manifolds. The engine is cooled by thermo-syphon, there being a single outlet at the top of the radiator which branches to each block of cylinders in the form of a Y. The timing gears are chain driven.

Except for the motor, the car is exactly the same as the other Regal, and it is significant that the use of the eight-cylinder engine has added only 44 pounds to the total weight of the car, while the horsepower has been greatly increased.

Regal Small Four

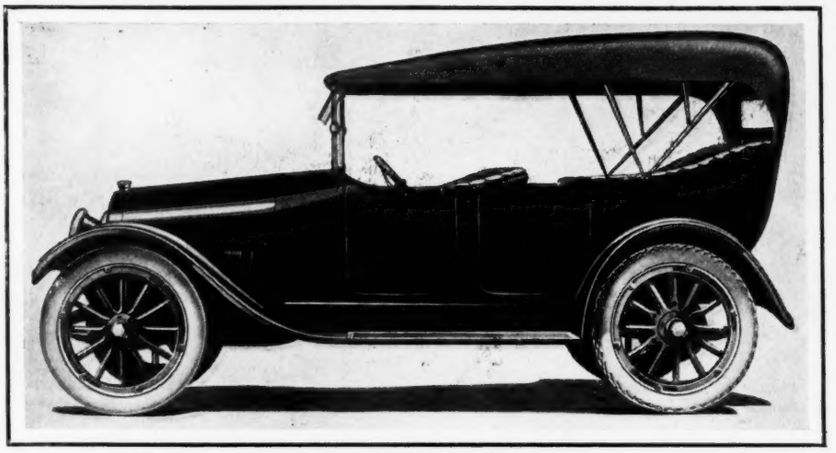
The other new Regal model is a little four having a 3 3-8 by 4 3-4-inch engine of nominal 20 horsepower, 30 by 3 1-2 inch tires, 106 inch wheelbase, and selling at $650 with complete electric equipment and one-man top, as well as the usual set of tools, etc.

The four cylinders are in block and the clutch and gearset are carried as a unit with the engine. The electric equipment includes a Splitdorf Aplco motor generator with battery ignition. The gearset is a three-speed selective with center control. Rear axle is floating on roller bearings, and the rear springs are of the cantilever type. The wheels have demountable rims. A streamline body is used and, like the rest of the Regal models, the radiator filler is under the hood so that the smooth line from windshield to radiator is not broken. The fuel is carried in the cowl and the filler is inside the forward compartment. A spare tire carrier is supplied at the rear.

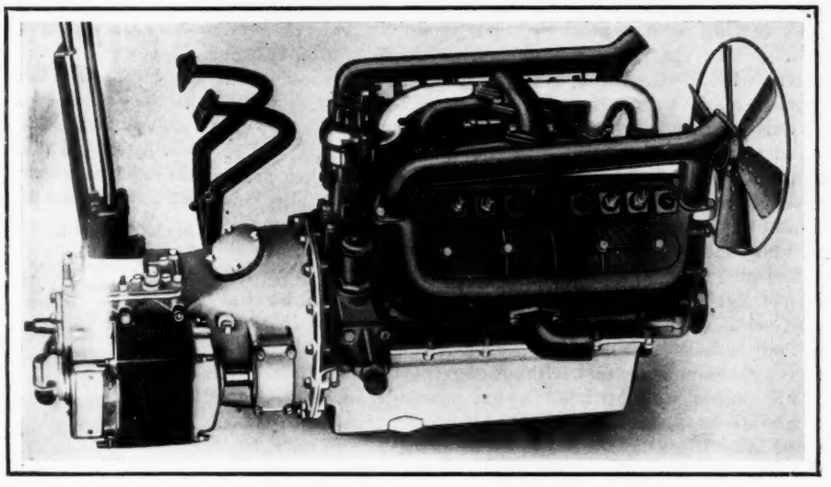
Another of the new cars to make its début at the Coliseum is the eight-cylinder Cole at $1,785 which was described in detail in THE AUTOMOBILE for January 21.

Imperial Six

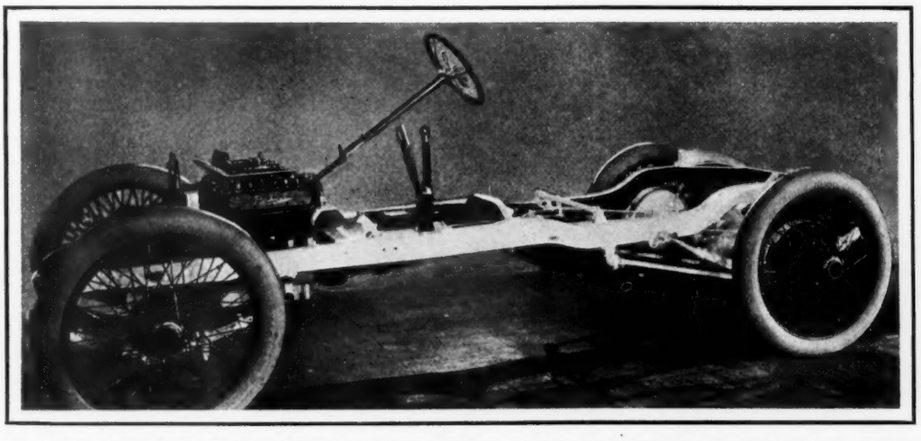
The new Imperial six-cylinder model 66 lists at $1,285



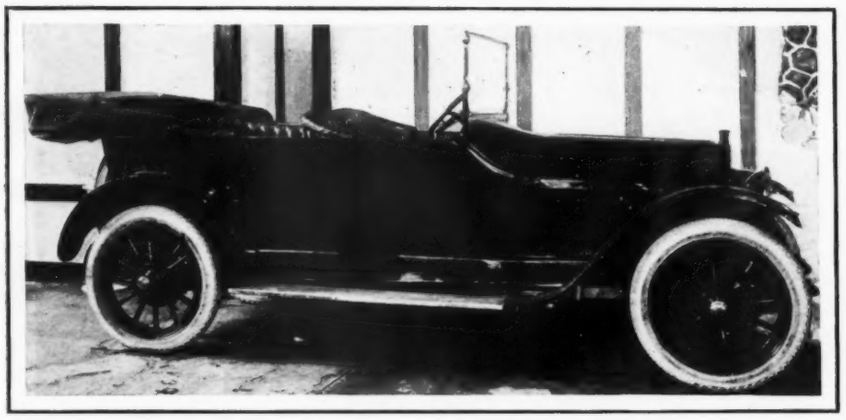
New Ross eight-cylinder touring model announced at the Chicago show



View of the new Ross eight-cylinder 90-degree V motor



View of the eight-cylinder Abbott chassis, showing mounting of new motor and double-drop frame



The Imperial six touring car which was announced at the Chicago show

with electric equipment, one-man mohair top, demountable rims and regular equipment. The motor is a Continental block casting with L-head cylinders 3 by 5 inches in size. Cooling is by centrifugal pump and lubrication is by splash system with a circulating pump. A disk-clutch faced with Raybestos and a three-speed selective transmission complete the unit power plant, which is suspended at three points. Fuel is fed by pressure from a gasoline tank at the rear. The rear axle is a floating type on Hyatt high duty roller bearings with a 4 to 1 reduction on high and 12-inch brakes, internal and external, are supplied on the rear hubs. Left steering and center control are standard. The wheelbase is 122 inches, and tires are 33 by 4. The storage battery for the electric lighting and cranking system is carried under the front seat. The rear springs are three-quarter elliptic, and the body upholstering is made a special point, being designed to give maximum comfort without sagging.

The car is marketed as a five-passenger tourist with streamline body, the doors being unusually wide, with concealed hinges and latches.

Franklin Series Seven

A new Franklin chassis makes its appearance under a new model name, Series Seven. The feature of the new series is the inclosure of the overhead valves. Aside from this the only alteration from the car as described previously is the slight lengthening of the tonneau to give increased roominess and a general lightening of the chassis which amounts to a reduction of probably 24 pounds in the weight of the car as a whole.

The inclosure of the valves has been accomplished by placing a metal cover over the valve-operating mechanism on each of the separate cylinder heads. These covers bolt to flat bosses milled on top of the cylinder heads, and cover the valve springs and rocker arms completely, thus giving the increase in efficiency of the overhead valve without the noisy valve operation which sometimes is characteristic of this type.

New Halladay Six

Halladay cars, after a period of inactivity, are again to make their appearance on the market, this time as the product of the Barley Mfg. Co., Streator, Ill. The re-appearance of the Halladay is signalized by a new six-cylinder called the 6-40, which is to sell at $1,385. It embraces in design a Rutenber motor of 40-horsepower with L-head block cylinders. Oiling is by a combination force feed and circulating splash and cooling by centrifugal pump circulation combined with a belt-driven fan.

The carbureter is a Stromberg with the control lever for the air adjustment mounted on the steering control. Ignition and all the electric equipment is Westinghouse. A combined magneto and generator supplying the current for ignition and lighting, and in connection with the 6-volt, 100 ampere hour battery, supplies the Westinghouse flywheel starting motor, which is equipped with a Bendix gearshift.

The three-speed gearset and disk clutch are in unit with the motor, the whole power plant having three-point suspension. Gasoline is carried in a rear tank, and supplied to the carbureter by the Stewart vacuum system. Left steer and center control are stock features. A floating rear axle which runs on ball bearings is supplied and the rear springs are three-quarter elliptic. Tires are 34 by 4 inches on Firestone or Stanweld demountable rims, and a spare tire carrier is hung at the rear.

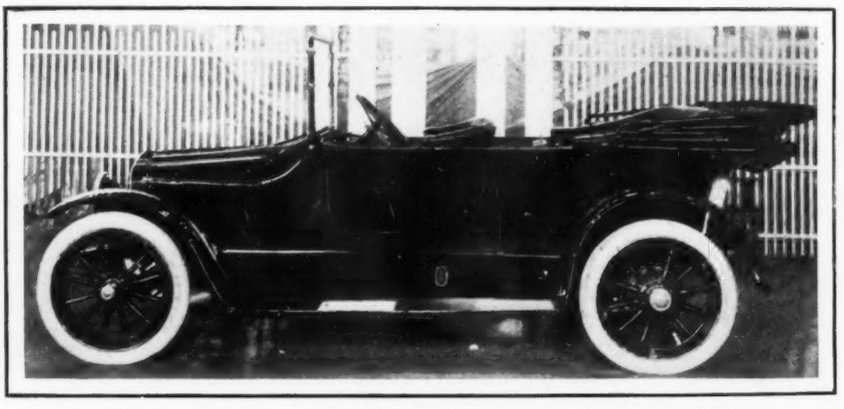
The body is of modified boat type. Individual front seats are fitted and there is an aisle between them. With the regular equipment are included, among other features, a one-man top, and an 8-day clock.

Smaller Moline-Knight

The Moline Automobile Co., Moline, Ill., is showing the motor of a smaller Moline-Knight car which is to be announced later. The motor itself is almost identical with the larger Moline-Knight, except for its smaller dimensions. It is understood that the motor is to be a part of the lighter and lower-priced Moline car. Its bore is 3 1-2 inches and its stroke 5 inches, and it is a block casting of clean exterior appearance. The only distinguishing feature between this engine and the larger Knight is in the novel way in which the ignition wires are carried up through the cylinder head between the two middle cylinders, so that the only exposed wiring or ignition connections are the short leads to the spark plugs. Ignition is supplied by means of a Connecticut igniter, current for which is produced by a generator driven by a lay-shaft on the timing gears. A separate cranking motor connects with gears cut on the flywheel. Another external change is the alteration of the exhaust manifold to give a more direct flow of the gas.

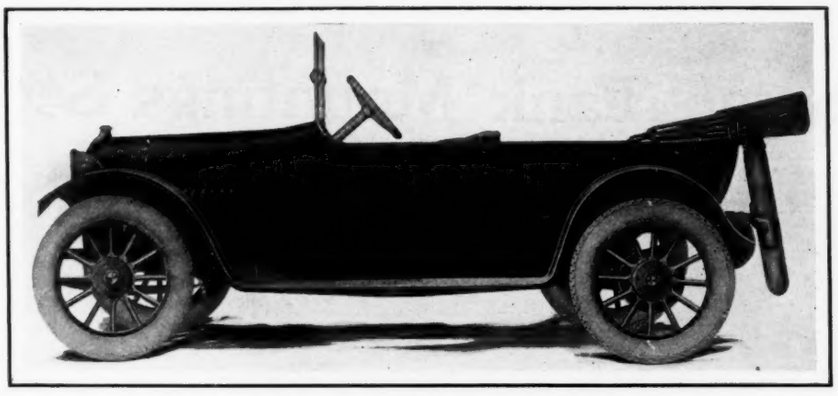
Shaw Taxicab

Although not at the show, a new car is on display on motor row as the product of a concern which heretofore has not built cars for the general market. This is the taxicab of



Regal light four, which embodies a smaller motor than the other four-cylinder car

the Walden W. Shaw Livery Co., Chicago. This concern has been building its own cars for local taxicab work for several years, but the demands from other cities for cars especially designed for this service has led it to announce that it will manufacture these cars for other livery companies. Orders from several other cities have been received and the concern states that it is in the position to produce about 500 cars a year. The cars are designed for quick and easy repairs and replacement as well as for wearing qualities for the special service for which they are intended. They have one or two outstanding features which distinguish cars for this service, as designed by the Walden Shaw company. One of these is the transmission brake, another the spiral bevel drive, and another the elimination of brake equalizers, it being found that in livery service, where for safety's sake the brakes had to be looked to every day in any of them, equalizers were a detriment. Easy gear shifting is made possible by a clutch brake. There is no spark advance, and a triple oiling system is provided, there being a constant level splash and force feed in addition to two plunger pumps operated by the camshaft. The pumps can be worked independently of each other, and in case both fail, sufficient lubrication for a 60-mile drive is provided in the splash reservoir.



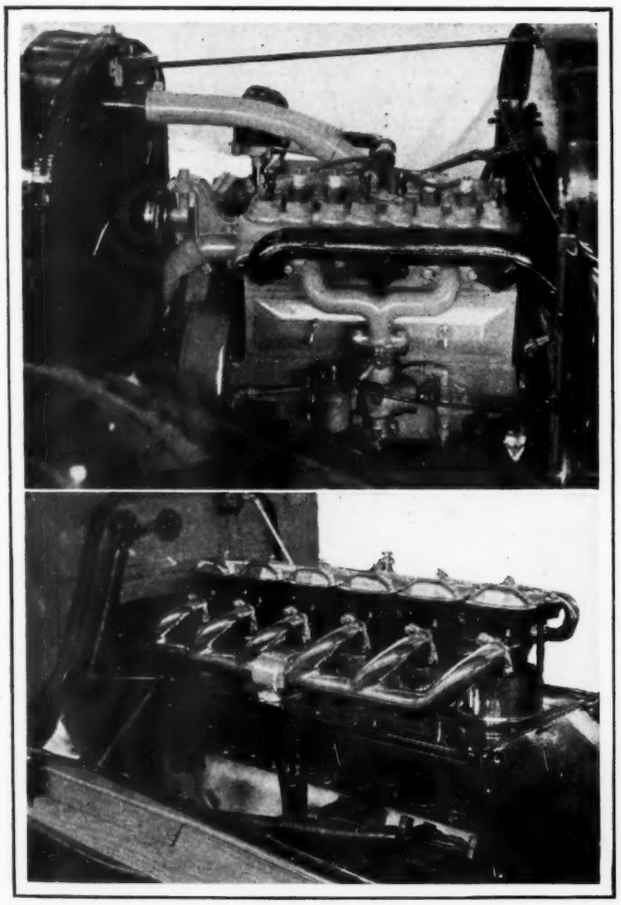
New Moline-Knight 40 touring car, which has the smallest Knight motor yet announced

To show in what way the special design of a vehicle when used to this service has been effective in keeping down operating costs, the Shaw company reports on the maintenance of its entire equipment for a period of 6 months show that the labor and maintenance per cab per day is 57 cents. The material cost is 35 cents and the painting 17 cents, making a daily bill on each cab of $1.09.

The Ogren Six

A six-cylinder car new to the field in general is the Ogren six, which has been on the market in a small way for about a year. This is the product of the Ogren Motor Car Co., Chicago, which expects to turn out about 250 cars within the next year. The car is built from standard parts as a seven-passenger touring car, a roadster and a limousine, the seven-passenger listing at $2,500.

The engine is a six-cylinder 3 3-4 by 5 1-2, L-head with Bosch magneto, Bosch-Rushmore cranking and lighting, Rayfield carbureter, Stewart vacuum fuel feed, Brown-Lipe three-speed gearset, left steering, center control, Timken axle and Kellogg power tire pump. The body is made by Obresch. In the seven-passenger touring body the extra seats are arranged to fold in the back of the front seat when five passengers are carried.



Upper—Regal light four-cylinder motor, which is shown at Chicago. Lower—The new Franklin six motor, which has the overhead valve construction inclosed

Marion Brings Out New Eight, Six and Four

CHICAGO, ILL., Jan. 26—*Special Telegram*—In the midst of all the rapid fire announcements of eight-cylinder cars during the show, the Marion Motor Car Co., Indianapolis, Ind., has gone the other manufacturers one better by announcing not only a new eight, but a new six and a new four. This makes the Marion line the only complete one so far as the number of cylinders is concerned.

All three of the models are built of standard units, the eight having a V-type, 3 1-8 by 4 1-2 motor of the conventional type, and wheelbase of 115 inches. It sells at $1,500 either as a roadster or five-passenger touring car.

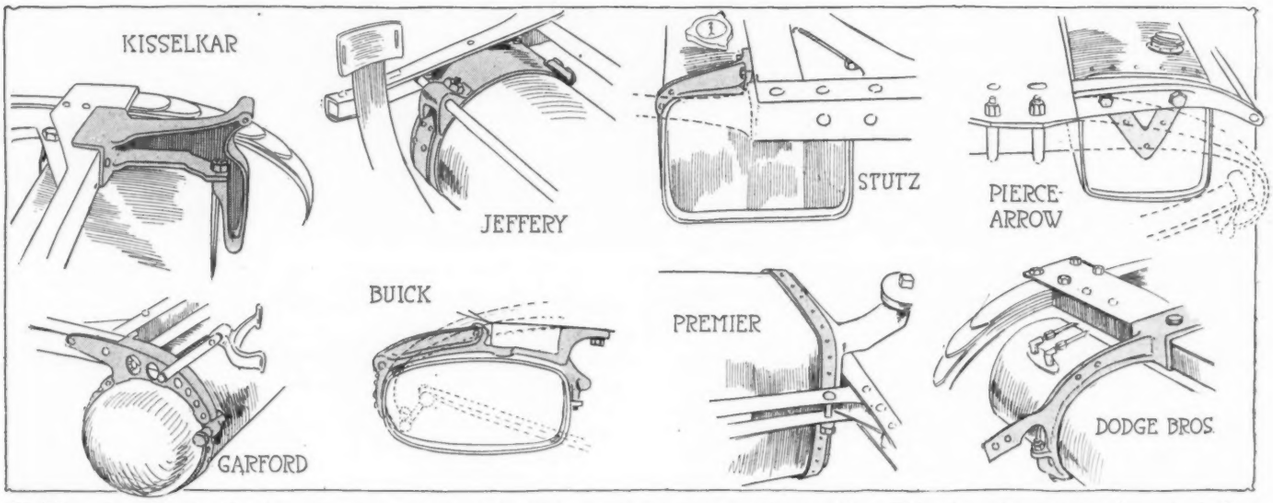
The four has a Continental block L-head engine, 3 3-4 by 5, and the same wheelbase as the eight. It sells for $1,250. The six has a 3 by 5 block L-head engine, a 122-inch wheelbase and sells for $1,350. The equipment in each case includes such fittings as one-man top, demountable rims, with one extra, rain vision, built-in windshield and graphite lubricated springs.

In every respect of general design, except engine and chassis length, the three cars are identical. The design includes a dry disk clutch and three-speed gearset in unit with the engine and spiral-bevel drive.

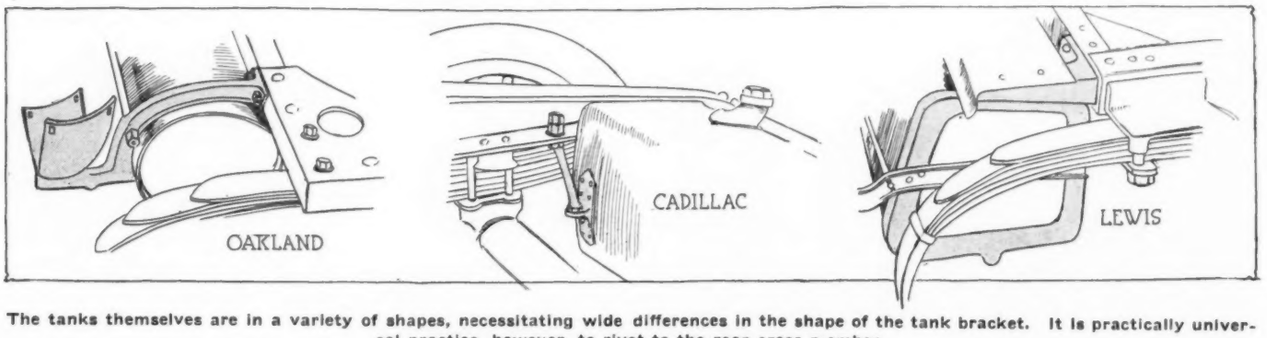
Motor equipment includes Bosch magneto, Gray & Davis lighting and starting, Stewart vacuum fuel feed from a tank at the rear and Fedders honeycomb radiator. The lighting system includes double bulb headlights, for city or country driving. Tires are 34 by 4.

The Mutual Motors Corp., which has the manufacturing of Marion cars, expects to be delivering within a very few weeks.

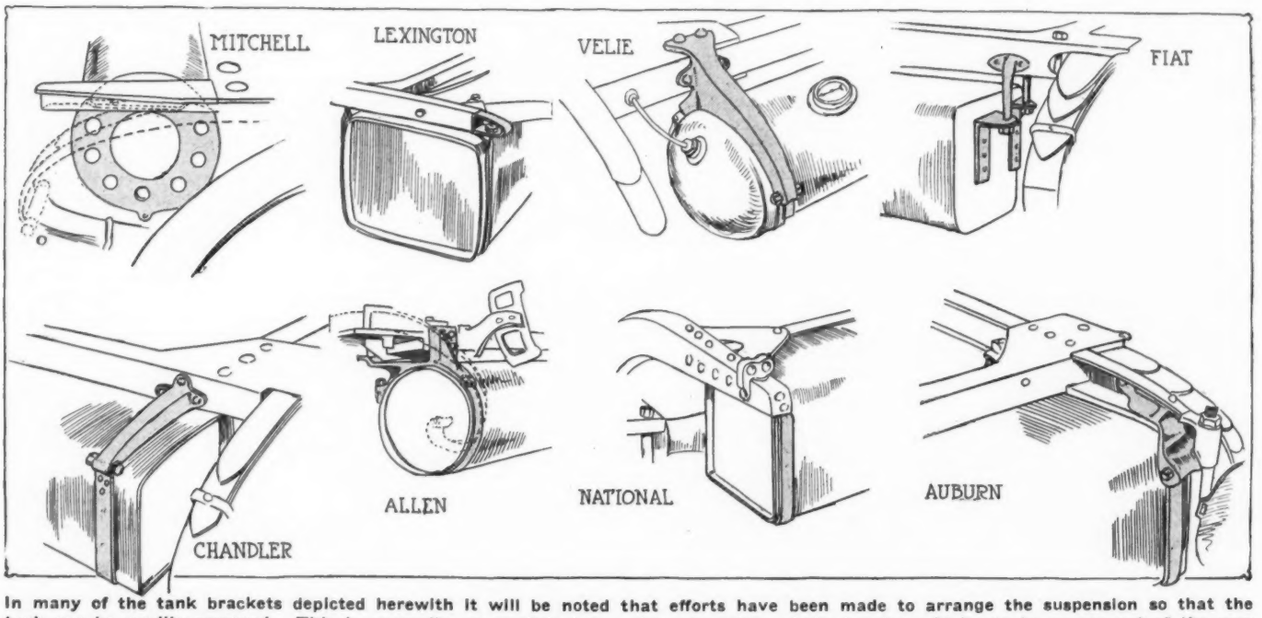
Some Tank Mountings Seen at Chicago



Rigidity of suspension is shown in the characteristic tank mountings illustrated herewith. This phase has become important since the widespread adoption of vacuum feed. Some makers are combining the tank bracket with the tire carrier, giving a rigid support for both with a minimum number of parts



The tanks themselves are in a variety of shapes, necessitating wide differences in the shape of the tank bracket. It is practically universal practice, however, to rivet to the rear cross member



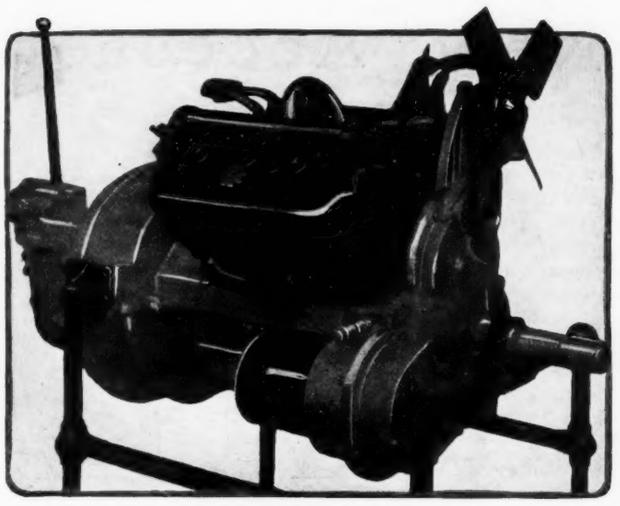
In many of the tank brackets depicted herewith it will be noted that efforts have been made to arrange the suspension so that the tank can be readily removed. This is generally accomplished by a hinged portion of the bracket which can be swung out of the way when it is desired to take off the tank

Davis Eight Uses Two Camshafts

ONE more eight-cylinder motor has made its appearance. This time the Davis Mfg. Co., Milwaukee, Wis., is the newcomer with a V-type with 90 degree cylinders. It is a conventional eight with 3 by 4-inch cylinders, giving a piston displacement of 226.2 cubic inches, and an S. A. E. rating of 28.8 horsepower. It is a high-speed design, showing its greatest efficiency between 2,200 and 2,600 r.p.m. and is intended for a gear ratio of approximately of 5.5 to 1.

Two of the unconventional features of this Davis eight are, first the use of two camshafts located side by side in the top of the crankcase, immediately below the apex of the V. One camshaft serves for actuating the valves in one cylinder block and the other for the opposite block, the object of using two shafts being that any desired timing can be had, and the use of rocker arms between the cams and the tappets is eliminated, consequently reducing the noise possibility. The valve timing employed is as follows: Intake opens 10 degrees late, closing 30 degrees late, and exhaust opens 45 degrees early, closing 5 degrees late. The tappets with mushroom ends bear direct on the cams and carry on their upper ends nut and lock nut for correcting the timing.

The other unconventional feature is the employment of thermo-syphon cooling for the two cylinder blocks. Water from the base of the radiator enters each block at its lowest point and well to the rear of the jacket, and the return pipes leave the highest point of the jacket at the forward end, there being individual hose connections between each cylinder block and the radiator. All valve seatings are entirely water-jacketed.

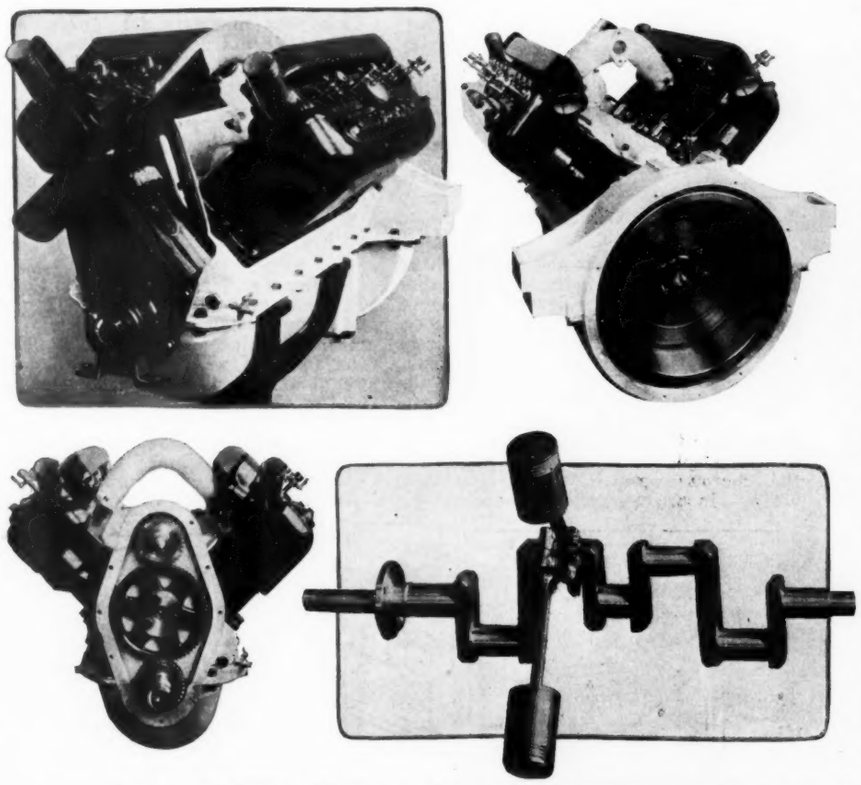


The compact Davis eight-cylinder motor

Spur gear trains are used for driving the two camshafts as well as the ignition system, a silent chain being employed to connect the crankshaft with the Allis-Chalmers motor-generator unit which is mounted under the right front motor arm. It is geared 3 to 1 to the crankshaft and no clutches are interposed, the silent chain connection being positive. In order to have chain adjustment the motor generator is mounted in an eccentric bushing surrounding the entire cylindrical unit, and this bushing in turn is clamped into the housing in the crankcase arm.

The motor is designed for battery coil ignition system with the timer-distributer element mounted on a short vertical shaft in the forward part of the V where it leaves all valve springs quite accessible. Lubrication is by a splash constant-level system and to guard against a surplus of oil in one cylinder block baffle plates are inserted in the open ends of the cylinders in this block, the other block being without baffles. The carbureter is located high in the V and attaches to a upwardly arched semi-circular type of intake manifold.

The rotating and reciprocating internal parts of the motor are generally conventional. Use is made of the yoke type connecting-rod in preference to the side-by side style, these are I-beam types, 8 inches center to center, the crankshaft, a two-bearing type, has main and journal bearings 1 3-4-inch in diameter, the front bearing is 3 inches long, the rear 4, and all crankpins are 2 1-4 inches long. Valves are 1 5-16 inches in



Views of the Buda eight described last week. It has thermo-syphon circulation, each block of cylinders having separate water leads. The intake pipe is jacketed and forms a connecting link between the cylinders. Being at the top of the water system it should be well warmed. The side-by-side connecting-rods are shown above, and also the accessible valve covers. Ignition apparatus is located between the cylinders, and the starter can be under either motor arm, the dynamo being combined with ignition

diameter in the clear and 7-32-inch lift. Each camshaft is supported on three bearings. Pistons measure 3 3-4 inches in length and carry three rings close to the piston head and one oil ring immediately below the wristpin.

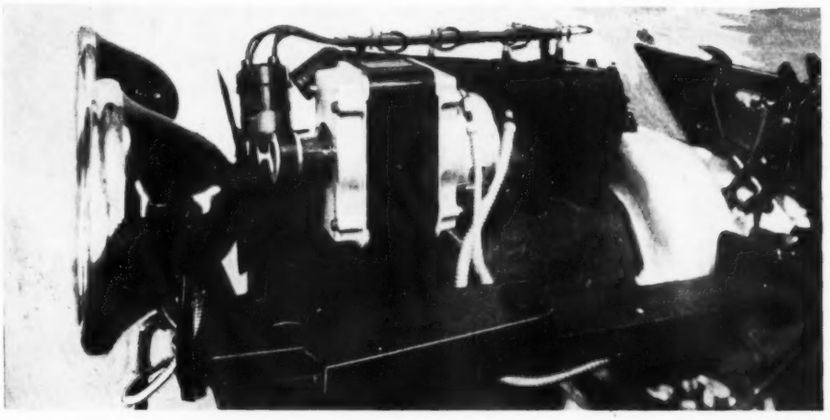
The motor is regularly designed to take a unit gearbox, the flywheel being completely housed for this purpose, and with the two supporting arms in the flywheel plane. A single forward support is used, giving three-point suspension.

New Accessories at the Show

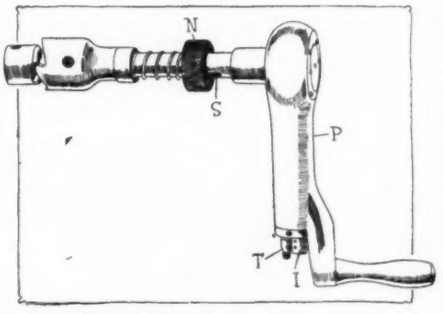
CHICAGO, ILL., Jan. 23.—The accessory exhibit at the Chicago show can boast of not more than two dozen new devices brought out since the New York show and among these there are perhaps only eight which are of real interest to the car owner, the others being garage necessities or manufacturers' propositions. One of the most attractive displays offered in the accessory layout is the new Westinghouse-Ford cranking, lighting and ignition system which was kept rather quiet until show time. The new Kellogg Ford tire pump, while it was announced a week ago by the company, is being displayed for the first time.

Chicago can be always relied upon to show spring wheels, safety fenders and other accessories of unusual construction, among them, being shown such devices as a combination pump and crankhandle, a heater which uses no coal, exhaust gas or water, but employs chemicals, a new shock absorber with three springs and a seating arrangement which allows of a two-passenger roadster being converted into a three-passenger design. In all, there are forty-nine exhibitors of accessories at Chicago who did not appear at New York.

New Westinghouse-Ford System—The Westinghouse exhibit is featured with a new cranking, lighting and ignition system for Ford cars, which sells for $90, and which consists of a 12-volt motor-generator, battery and ignition distributer which contains also the interrupter and step-up coil. The motor-generator externally differs little from the regular Westinghouse unit. It is driven by silent chain from the crankshaft and in order to allow of a means of driving the fan the belt is fastened to a pulley on the motor-generator shaft. The cutout which is used is a separate unit. In the mounting of the motor-generator two brackets are used, one of them being attached to the cylinder head by means of special bolts, and the other being attached to the lower portion of the cylinder casting.



New Westinghouse starting, lighting and ignition system for Ford cars as it appears mounted on motor

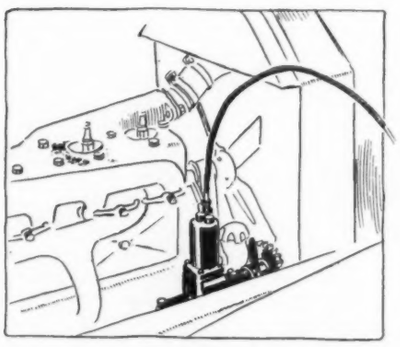


DeLaunty combination tire pump and crank

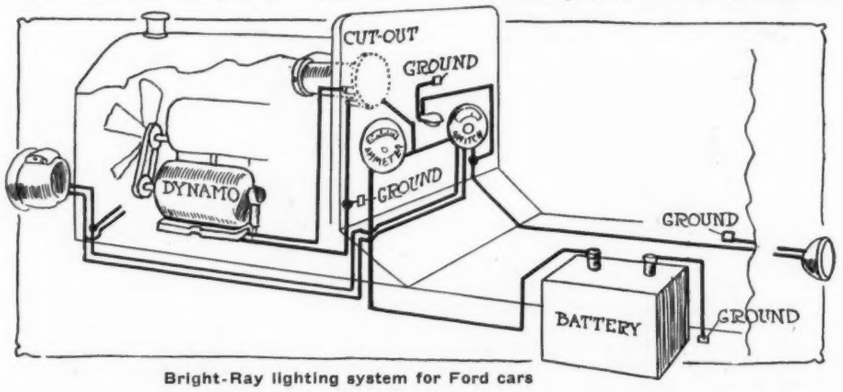
The ignition distributer is an entirely new affair, being a combination timer, distributer and coil. It is located on the opposite side of the motor-generator, the right side, and is driven by two bevel gears from the timing case. This allows of a vertical unit. The price is $75 for the motor-generator, battery, switch, wiring—in fact, everything except the lamps—and at $90 the ignition distributer also is furnished.

Kellogg Pump—Another new single-cylinder pump, Model 111, just brought out by the Kellogg Mfg. Co., is being shown at its booth for the first time. This new pump is for Fords, and in general construction is like the one-cylinder Model 101. It is an all-metal design with a poppet valve for inlet and exhaust, uses wick oiling and sells for $9.50 complete, ready for attachment. The drive is directly by gears from the front end, as shown in the illustration herewith, a hand lever being used to throw the gears into mesh. It is stated the pump may be installed in 20 minutes without moving any of the essential parts of the car.

DeLaunty Tire Pump and Crank—A most unusual combination accessory is being shown by the Chicago Automatic Machine Co., the device being in the form of a unit single-cylinder tire pump and crank handle. This unit replaces the present crank on the car. The pump is contained in the portion P in the illustration herewith, and is driven by a floating shaft within the one marked S. When the pump is to be used the nut N is pushed inward, this causing



Kellogg one-cylinder tire pump for Fords



Bright-Ray lighting system for Ford cars

the floating shaft to be connected with the crankshaft. The air inlet for the pump is shown at I, and the hose connection at T. The price is $12.50, and for the Ford type $10.

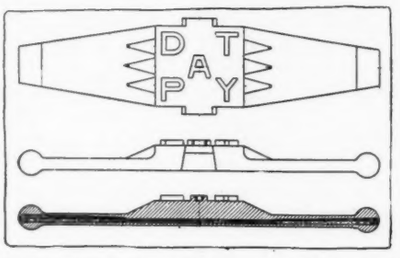
Bright-Ray Ford Outfit—A new Ford lighting system is being shown by the Paul G. Nirhoff Co., Chicago, the outfit consisting of a generator driven by belt from the fan shaft, a battery, cutout, ammeter, wiring, etc. The generator produces 8 amperes at 6 volts, and is driven, as shown herewith, by a belt which is looped around a special pulley fastened to the fanshaft. The cutout is a separate unit mounted on the dash together with an ammeter and switch. The outfit complete, including the parts mentioned, together with two headlights and tail light, 6-volt 30-ampere-hour battery, wiring, bolts, etc., is $45, and without the lamps is $38.50.

Two other new products shown for the first time, but marketed for about 1 year, are the Red Devil electrolytic rectifier and the Red Devil non-spillable battery, which type often is referred to as a dry storage battery.

Day Sectional Tread—This is a puncture and blowout preventing device shown by the Day Sectional Casing Co., Chicago. It consists of a rubber and fabric tread made in a number of sections fastened together so as to be slipped in place as a unit. There are spaces between each section, and this, together with the rough surface of the sections, is said to prevent skidding. Prices range from $18.75 for the 30 by 3½ to $25.50 for the 37 by 4.

So-Sha-Belle—The So-Sha-Belle Co., Los Angeles, Cal., is exhibiting for the first time a seating arrangement which allows of three persons sitting in the tonneau or front compartment, where the present plan allows of only two being seated comfortably. It is an arrangement which places the seats in staggered fashion, the center one either ahead or behind the two outer cushions. This seating arrangement may be used on either old or new cars and requires changes in the upholstery and seat frame and does not interfere with the body lines. By the use of this arrangement the passengers have individual seats and arm rests. It is a particularly desirable feature in two-passenger roadsters.

Catpaw Shock Absorber—This is an entirely new type of auxiliary spring shock absorber, and is shown by the Frazer Lubricator Co., New York. As shown in the illustration herewith, the Catpaw consists of two cylinders, each containing three springs, one set upright and two smaller ones placed at an angle above it. Each spring has an individual cylinder for operation. Aside from the three springs there is an air cushion cylinder below the large spring shown in the illustration herewith. It will be noted that the bar B is wedge-shaped at its upper end and that the sides can touch the shoes S under the two smaller springs. It is clear that any upward movement of the bar B will carry with it the large spring, leaving the two smaller ones free, and in order to make the large spring return to normal slowly, the air chamber shown comes into play. Also, the downward movement of the bar causes the wedge to exert pressure against the two shoes and hence the smaller springs are compressed. The combination of the two smaller springs with the air chamber is said to produce excellent results in checking rebound. The price of the absorber is $40 for cars up to 2,200 pounds.



Upper—Day sectional tread mounted on wheel
Lower—Section, elevation and plan of individual section of Day tread

A Ford type is shown, but it employs only one large spring, which is fitted into a cylinder open at the bottom, as shown in the illustration herewith.

Chicago Spring Wheel—A new type of spring wheel is being shown by Gray Bros., Chicago, this wheel employing a flexible hub with special side flanges. These flanges have slots into which fit the lower portion of special wedge-shaped steel spokes. The upper end of the spokes are in contact with rollers, so that when the wheel strikes a bump the spokes slide over the rollers, the movement being taken up in the hub slots.

Dixon's Grease—The Dixon Crucible Co., Jersey City, N. J., is showing a new form of grease for differential housings which it claims will not make its way to the brake-bands. It is No. 680 and sells for 30 cents per pound in 5-pound tins.

New Solar Searchlight—A new type of searchlight is being shown by the Badger Brass Mfg. Co., Kenosha, Wis., which may be moved vertically or laterally with a lever and locked in any desired position. The lamp used is a new parabola design with the reflector in the body with a washer between it and the glass. The casing is water-proof and dust-proof and has an outside adjustment for bulb focusing. The searchlight complete sells for $14.75 in black and nickel.

Grau Shock Absorber—This is a new Ford absorber on exhibition for the first time. It is being shown by the Grau Shock Absorber Co., Chicago. It is a single, coil-spring type with the mesh exposed. It replaces the regular Ford shackles and sells for $5 per set of four.

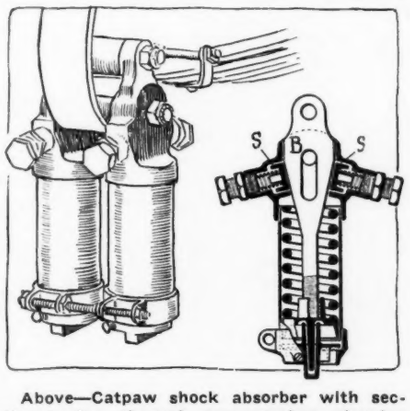
Telescope Fender—A new type of safety fender is being exhibited by the Telescope Fender Co., Cleveland, O., this device automatically stopping the engine and dropping a curtain to the ground so as to prevent the person from being caught under the wheels. When a person strikes the fender the ignition is cut out, the curtain drops and the car stops.

Vesta Batteries—The Vesta Accumulator Co., Chicago, is displaying an entirely new line of batteries for starting and lighting service, and a new type of headlight for Ford cars. The new batteries are made in all standard sizes and in 6, 12, 16, 18 and 24 volt form. All capacities are offered. A fair idea of the prices will be had from these: 6-volt, 80-ampere-hour, $35; 12-volt, 80-ampere-hour, $69.25, and 24-volt, 53-ampere-hour, $108.

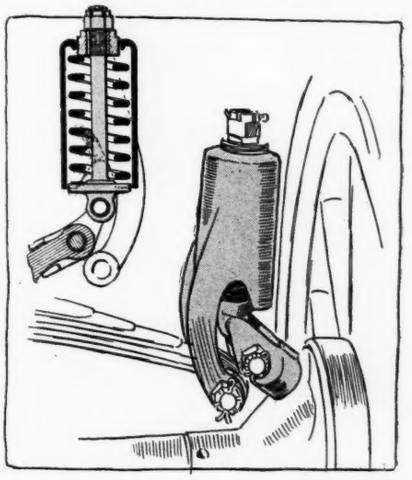
The new Ford headlight is designed to take the place of the gas lamps furnished, and for this purpose a special bracket is furnished. The price is $12.

Doehler Bearing Co.—For the first time the Doehler Die Casting Co., Toledo, O., shows die-casting finished in brass, enamel, copper, etc., the concern having extended its line to include finishing also. A complete line of aluminum die-castings are shown, the concern having gone into such production to a greater extent than heretofore.

Pierce Quadrant—The Pierce Speed Controller Co., Anderson, Ind., has something novel in the way of a Ford accessory—the Pierce auxiliary quadrant. This is a throttle quadrant which is fastened to the one already on the Ford car. It allows of the throttle lever being adjusted more accurately, the regular sector requiring that the lever be set into cuts in the quadrant. These cuts, the Pierce company claims, change the speed one-third of a mile per hour, which often is not accurate enough for the driver. With the Pierce device the lever may be moved any fraction of an inch. The price is $1, and it is easy to install.



Above—Catpaw shock absorber with sectional view through one member, showing wedge principle



Right—Special Catpaw Ford shock absorber

Compensated Cantilever Eliminates Roll

A New Springing System Adopted by Large European Manufacturer—Appears an Important Advance

WHEN a wheel on one side of an automobile drops into a hole in the road and the wheel on the other side remains on a smooth surface there is a natural tendency for the body to follow the axle, and tilt over in the direction that the axle has to incline. On a rough road this often produces a heavy roll that is very uncomfortable for the passengers, besides racking the frame. A device which has just been adopted by the Wolseley Co., the largest producer in Great Britain, and one of the largest in Europe, is described in *The Autocar* of January 16. The existence of this new system has been known to a few friends of the company's chief engineering men, for over a year, but the experiments have only recently been completed and the new system got ready for manufacturing.

Broadly, its basic idea is to force both rear springs to work together whether the shock is on one or on both sides of the axle, to play off the strength of one spring against the other so as to reduce rolling tendencies. The following description is extracted from our contemporary's account.

Effect of Periodicity

It is obvious that the stiffer the spring the quicker the periodicity, the more rapid its vibration. On the other hand, the more flexible the spring the slower the periodicity, and consequently the greater the movement. The more flexible the spring the greater the movement caused by a road shock, and the easier the motion. The leaf springs used in most cars, whether they be of the semi-elliptic, three-quarter-elliptic, or cantilever type, all conform generally to this law.

If we go to a car and regard it from the back, and consider that one wheel may have dropped into a hole, it is apparent that the body will make a corresponding movement. One side of the body will fall slightly, and this movement will introduce to the body as a whole a heeling-over or roll. The amount which the body drops to a large extent is controlled by the one spring upon the side on which the hole has occurred. The roll is caused by the fact that the sprung portion of the car has been given a tendency to turn about its center of gravity. This rolling tendency is aided by the spring upon the side of the car opposite to the hole endeavoring to escape from its normal state of compression, with the result that the roll is augmented. The *two* springs together then control a rolling movement of the car body and provide for it a rolling periodicity which is quite distinct from the vertical periodicity of one spring or the other separately. It is essential to the comfort of the car, and also to its stability, that the rolling periodicity should be a quick one, in other words a return to the upright position, and a maintenance of it, should take place as soon as possible. The vertical periodicity of the springs, however, should be as slow as it can be made, because the slower the vertical periodicity the slower is the vertical movement transmitted to the passengers of the car. Unfortunately, however, as has already been shown, the combined vertical periodicities of the springs also control the rolling periodicity of the body, and should the vertical periodicity be slow the rolling periodicity is even more slow, which is just what is not wanted. In ordinary springing systems, therefore, a happy mean has to be struck.

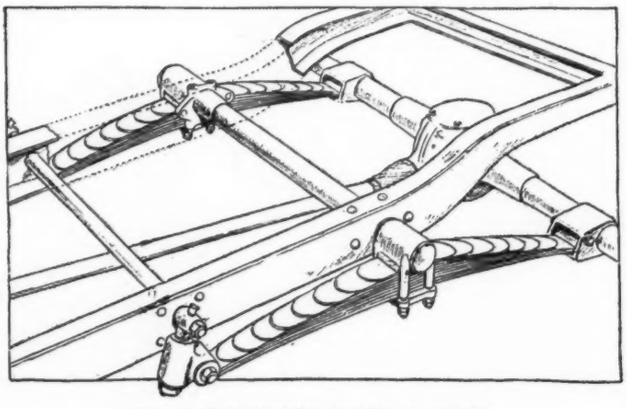


Fig. 1—Compensated cantilever springs

The Wolseley solution of the difficulty, which, by the way, is the invention of A. A. Remington, consists in so connecting the rear springs on each side of the car that a quicker periodicity when rolling is ensured than when a vertical movement of the body in relation to the axle is taking place. This means that a far greater latitude of compromise becomes possible. The principle of the invention lies in the cross connection of the centers of the two springs and in the present evolution of it a cantilever form of springing is employed because it lends itself admirably without adding complication. As shown in Fig. 1, the system consists of a single cantilever spring on each side of the chassis. Each spring is hinged to the chassis in the center, attached to the rear axle at the rear end, and shackled to the chassis frame at the front end. The great point of the device, however, is that the central hinged pin of the spring on one side is carried across the frame in the form of a stout tubular cross member, to become the hinge pin of the spring upon the other side. In other words, the center of each spring is firmly attached to an extremity of this tubular cross member, and the tubular cross member is free to rock in the frame. So long as the rear axle of the car receives road shocks, which cause vertical oscillations only, the transverse connecting member turns somewhat in the frame under the influence of the two spring movements, and the full elastic capacity of the whole length of each spring is brought into play, thus giving a comparatively slow vertical periodicity. If, however, the body of the car tries to roll over on to one side, the effect is that the spring upon one side tends to turn the transverse member in one direction, whilst the spring upon the other side is tending to turn the transverse member in the opposite direction, and this ultimately results in the transverse member remaining stationary.

The front portions of the spring, that is, the portions between the rocking cross member and the front shackles, become inoperative, with the result that only about half or less of each spring, *i.e.*, the portion between the rocking cross member and the rear axle itself comes into action. Half a spring being stiffer than a whole spring, speaking loosely, the resulting rolling periodicity is speeded up and is considerably faster than would be the case if the whole length of each spring were in action. By arranging the rear portion of each cantilever spring so that its rate of deflection under a given load is greater than that of the front portion of the

same spring, it is possible still further to reduce the tendency to roll.

It would possibly be of assistance in grasping the principle of the device if attention were directed to the diagram in Fig. 2. This shows an alternative design of the spring, in which the rocking cross tube appears as usual, and extending back from each end of it is one half of a cantilever spring. To the center of the cross tube is attached two substantial half-cantilevers side by side, which are shackled to the frame at the forward end. It will be realized that a vertical movement, which affects both sides of the car more or less alike, deflects the springs A and B upwards, and also, as the tube is rocked, it endeavors to bend the end of the springs C downwards against the restraining influence of the shackle. If, on the other hand, the axle is twisted and the end A endeavors to rise simultaneously as end B endeavors to fall, it will be realized that the quarrel must be taken up between the springs A and B in endeavoring to flex in opposite directions, the stresses induced by each being taken up by the cross tube which has no tendency to movement and therefore no tendency to flex the springs C. A moment's reflection will show that the twisting of the axle in the manner shown is exactly the same really as keeping the axle still and twisting the frame of the car in relation to the axle, which, of course, is rolling pure and simple.

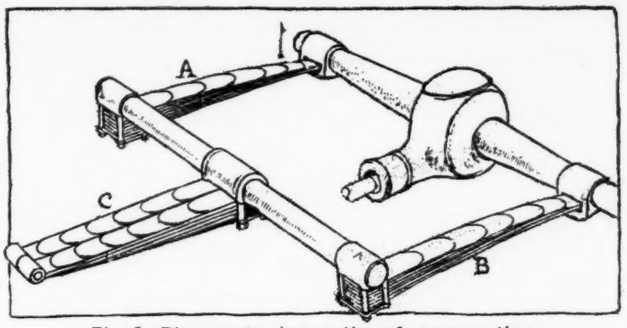


Fig. 2—Diagram to show action of compensation

Trying Out the System

We turn now to the practical side of the question. It must not be supposed that the Wolseley Co., having evolved this springing system, were content with theoretical results. For a long time past they have been experimenting and carrying on research work with scale models. In order, however, to obtain direct tests of actual mechanism they laid down in their works a special plant for the purpose. A large pit having been prepared in the floor of one of the shops, a massive shaft carried on suitable bearings was installed and provided with two drums some 5 feet or more in diameter and from 2 feet to 3 feet wide, which were spaced apart a distance suitable to correspond with an ample margin, with the wheel tracks of their various types of cars. A detachable flooring was then built to cover in the pit in such a way that it was possible to drive a car into position so that each of its rear wheels rested upon a drum.

The front wheels of the car having been suitably scotched so as to prevent movement forward or backward, it was only necessary to provide upon the surface of one of the drums a hollow comparable in depth and size with a known hole, in order to reproduce fairly closely actual road conditions. The road wheels of the car to be tested were driven by the engine in the ordinary way, and the wheels in turn drive the drum which turns idly, that is, without any load other than friction upon it.

Running a car upon the drum makes it possible to observe and to measure accurately the actual movements made by the axle in relation to the ground, the car body in relation to the ground, and the car body in relation to the axle, all at different speeds. A recording apparatus, consisting of a revolving drum to which a paper could be attached, is arranged in a suitable position opposite the hub cap of the wheel resting on the drum having the hole in it. A fitting was provided on the hub cap to take a spring loaded pencil capable of tracing a line upon the drum, and thus indicating the actual path of the wheel. A similar pencil attached to the light framework was connected to the frame of the car itself. It should be mentioned that the revolving recording drum was driven by suitable gearing and a belt from the main drums upon which the wheels revolved.

Graphs Show Action

Fig. 3 shows the graphs taken by the apparatus with the wheels of the car traveling round at a rate equal to one mile per hour on the road. The top graph is that traced by the pencil and attached to the body of the car, and the lower one is that traced by the pencil attached to the axle of the wheel. The straight line running through the upper portion of the top graph represents a kind of datum line showing the position of the body of the car when stationary on the drum, and the other straight line of this same graph is again a kind of datum line showing the position of the body of the car with a wheel at the bottom of a hole. It should be mentioned that the relative positions of these two lines are not very regular, for the reason that, owing to the friction of the leaves of the springs, the car does not always set in exactly the same level when at rest under a given load. The straight line running through the top of the lower graph represents a datum line showing the position of the pencil in the center of the hub when the wheel is resting at the bottom of a hole in the drum. The first graph shows the car with the driver only on board, travelling at the rate of 1 mile per hour. Looking at the lower graph, it will be seen that the wheel drops right into the bottom of the hole as shown by the downwardly pointing peak actually touching the hole datum line. Instead, however, of this peak being of an inverted conical shape or

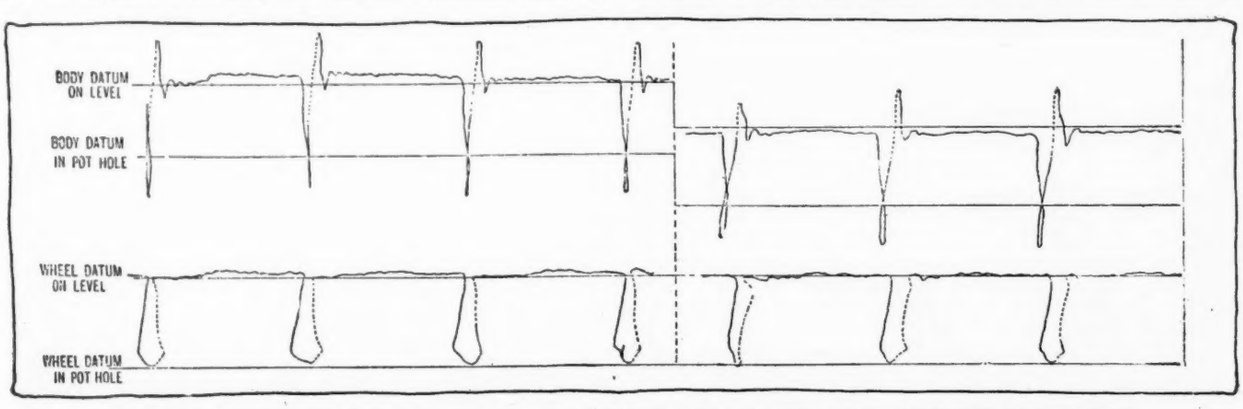


Fig 3—Graphs of car and axle movement at 1 mile per hour. Left with driver only. Right with five passengers

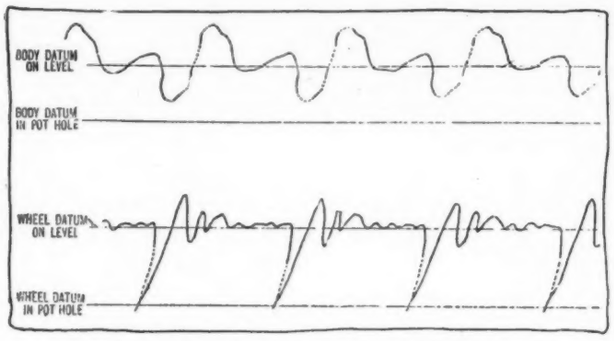


Fig. 4—Graph at 10 miles per hour with driver only

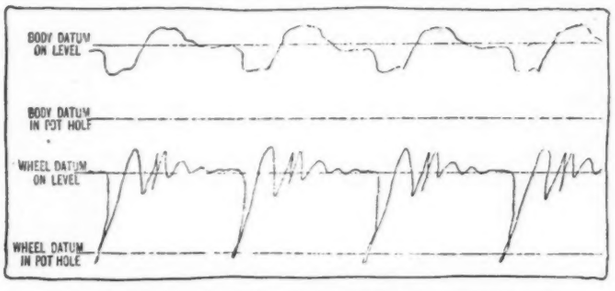


Fig. 5—Graph at 10 miles per hour with five passengers

even more or less parallel straight lines, it will be seen that it swells out in size towards the bottom. This is due to the drums, upon which the road wheels are revolving, running idly, with the result that, when the wheel drops into the hole, the drum is given a slight exhilaration, and when the wheel climbs out of the hole it is given a slight retardation, so that the bottom of the hole appears to be wider than the top. The first noticeable peculiarity regarding the movement of the body traced on the upper graph is that its amplitude is very considerably greater than the depth of the hole. This is due to the inertia of the body. It will be noticed that the amplitude of the movement of the body very quickly dies down. The graphs on right in Fig. 3 were taken with a car traveling at 1 mile an hour as before, but with a full complement of five passengers. It will be noticed that the body datum line and its attendant hole datum line have dropped a considerable

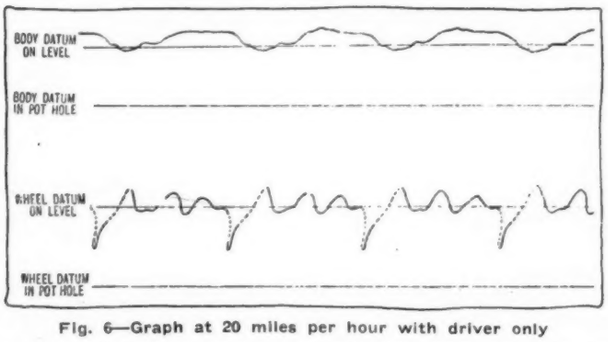


Fig. 6—Graph at 20 miles per hour with driver only

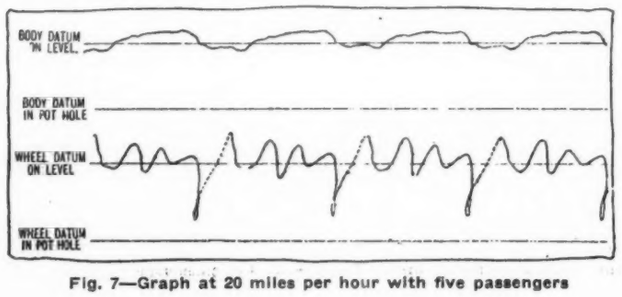


Fig. 7—Graph at 20 miles per hour with five passengers

degree lower. Figs. 4 and 5 show similar graphs at 10 miles an hour; Figs. 6 and 7 at 20 miles.

Figs. 8 and 9 show the car traveling at 30 miles an hour with the driver only on board, and five passengers respectively. These last two graphs show that the body movement becomes very much less at the higher speed—in fact, so little as to produce almost a straight line. To sum up, these graphs prove indisputably that, with compensated cantilever springs, an increase of car speed results in a decrease of discomfort.

Tests on Different Springs

Knowing the movement given to one wheel of the car by the hole, it is interesting to ascertain the movement transmitted to the body on that side of the car, and also the movement of the body on the other side of the car. The apparatus used was a piece of steel bolted across the back of the body having at each end a pointer. Attached to the ground opposite each pointer end is a vertical pillar, to which are at-

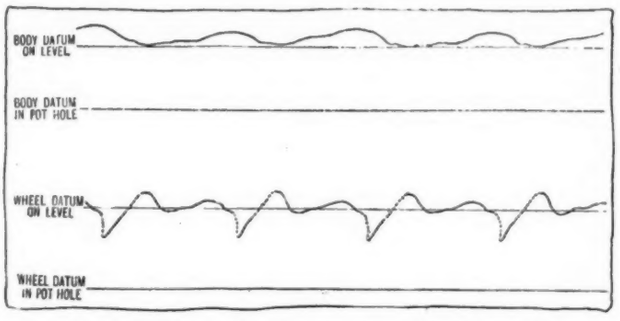


Fig. 8—Graph at 30 miles per hour with driver only

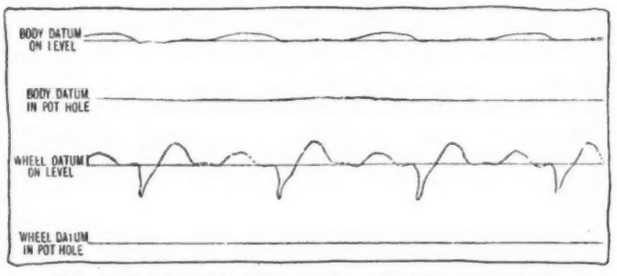


Fig. 9—Graph at 30 miles per hour with five passengers

tached horizontal fingers capable of adjustment up and down. The car was arranged to drive the drum at the approximate speed of ten miles an hour with five passengers on board. While the car was running the horizontal fingers on each side were adjusted separately until the lower finger marked the lowest extreme of movement of the pointer attached to the car, while the upper finger marked the upper extreme of the movement. With five passengers on board the following results were obtained:

At 10 miles an hour—
On the smooth running side of the car ..... 1¾ in.
On the rough running side of the car ..... 2¼ in.
At 20 miles an hour—
On the smooth running side of the car ..... 11/16 in.
On the rough running side of the car ..... ¾ in.
At 30 miles an hour—
On the smooth running side of the car ..... ⅜ in.
On the rough running side of the car ..... ⅜ in.

For the purpose of obtaining some idea of the behavior of a car sprung in the usual manner on three-quarter elliptic springs, a vehicle of this kind was placed upon the drums and subjected to a similar test. The results were as follows with five passengers on board:

At 10 miles an hour—
Smooth side ..... ⅞ in.
Rough side ..... 1⅞ in.
At 20 miles an hour—
Smooth side ..... ¾ in.
Rough side ..... 1½ in.
At 30 miles an hour—
Smooth side ..... ¾ in.
Rough side ..... ¾ in.

Wheels for Commercial Vehicles

Different Types of Built-Up Steel Wheels in Use. Need for Standardization of Tires and of Axle Fittings.

By Thomas Clarkson

Member Institute of Automobile Engineers of Great Britain

EDITOR'S NOTE.—*Thomas Clarkson was one of the pioneers in the motor bus business, having satisfactory steam buses running years before the gasoline type had become reliable. He has thus gained a very wide experience of the subject treated in this paper since the C. M. wheel was made for the Clarkson bus after trial and failure of other kinds. He will be remembered by many in this country as one of the party of English automobile engineers who were the guests of the S. A. E. at their* 1913 *summer meeting.*

THE steel wheel hitherto most extensively employed is a casting, and up to the present the British steelfounders appear to have had only qualified success in the production of such castings. A casting is always liable to blowholes and to internal stresses owing to the warring forces of contraction and cohesion, and a good proportion of the ultimate strength of the material in a wheel may be neutralized by internal stresses, the existence of which is at present unknown.

Another difficulty in connection with the use of castings is the inequality of thickness in the material, which causes local variations in the strength, and also results in imperfect balance, which has a deleterious effect upon the life of the tires which are fitted to such wheels.

A few years ago, Mr. Morison and the author looked into the question with a view to producing a type of wheel which would be free from the drawbacks of cast material, and which should, as a natural consequence, be both lighter and stronger. The so-called C.-M. Wheels are the result. These are built up, see Figs. 1, 2, and are constructed entirely of forged steel. The spokes are tubular, and are welded electrically under pressure to the hub and also to the rim flanges. The hub, Fig. 2, is a drop forging having bosses corresponding to the spokes, and these are machined to a section which corresponds exactly to the section of the tubular spoke. Butt welding is employed, which has the advantage of preserving the uniformity of the section and avoiding sudden change of section, which is always liable to develop disturbing stresses, resulting in strain and fracture.

The rim is pressed up from a steel plate, and the two edges are flanged, one inwardly, and the other outwardly, so as to form a stop for the tire. The rims were formerly machined both inside and out, but this is now found to be unnecessary, as the pressing can be done with sufficient accuracy. The spoke flanges are united to the rim either by rivetting or by spot welding.

Permission was obtained from the Commissioner of Police to test the wheels on public service buses in London, than which the author believes there is no more severe test for a commercial motor wheel, owing to the exceptional character and conditions of the service. After the trial wheels had run over 20,000 miles, they were subjected to special tests by the engineer of the chief commissioner, these showing no permanent set was created by an axial load of 12,000 pounds.

As a result permission was accorded to extend the use of these wheels for public service buses, and up to the present the distance covered by these wheels has amounted to upwards of 22,000,000 miles.

The leading points of the C.-M. Wheel are that, being built up, it is free from internal stresses, and as a consequence the whole of the material in the wheel is available to resist useful stress, while there is, of course, no chance of a blowhole anywhere in the wheel. Next, the material of each part of the wheel and each weld can be tested before the wheel is completed, for which special machinery is provided; and lastly, the rim, being pressed out of a plate or rolled, is of practically uniform thickness, and the wheel is in consequence balanced very perfectly.

The chief drawback to the general adoption of this wheel has been the higher cost of production, due to the increased labor charges and the employment of a superior grade of material. The hubs are exceptionally large drop forgings, consequently the dies are costly, and very few British firms are equipped with hammers of sufficient power for this class of work. This difficulty is being overcome by a modified construction in which the hub is forged from a circular blank. The blank is first cupped, and on the cylindrical surface formed by the cupping, spoke bosses are pressed out from the center. This construction results in a material saving in the cost of manufacture. Other economies have been effected, and the author believes that these wheels will soon be produced at a cost which compares favorably with that of cast wheels.

Wants Standard Hub

One cause which has militated in the past, and which still militates, against the cheap production of wheels, is the

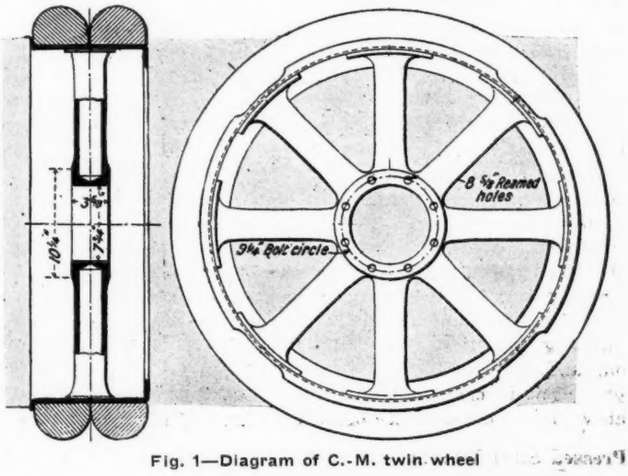


Fig. 1—Diagram of C.-M. twin wheel

WEIGHT OF TWIN WHEELS WITHOUT TIRES

Size of Tires Suitable for Rims in Mm.	Weight per Wheel
760 × 90	122 lb.
860 × 90	130 lb.
1020 × 90	145 lb.

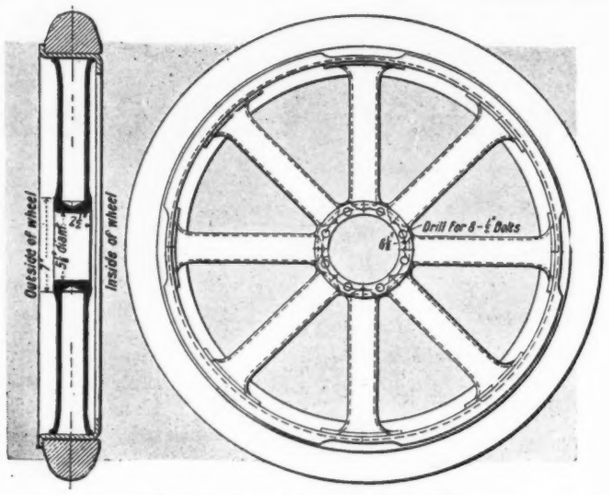


Fig. 2—Diagram of single C.-M. wheel

WEIGHT OF SINGLE WHEELS WITHOUT TIRES

Size of Tires Suitable for Rims in Mm.	Weight per Wheel
820 × 100	76 lb.
870 × 100	80 lb.
960 × 100	92 lb.
900 × 120	100 lb.
920 × 120	92 lb.

unfortunate variations in design which are so prevalent amongst makers of commercial motors, more particularly in connection with the details of the axle bearings in the wheel hub and the method of attaching the driving gear and the brake drums. During the past year most of the leading makers of commercial motors of from 30 cwt. to 5 tons capacity, and also representatives of the War Department, have been approached with a view to obtaining standardization. For the present, the difficulty has been to a large extent overcome by making the wheel hub interchangeable, and of a diameter sufficiently large to accommodate various designs of hub centers. This, to some extent, obviates the necessity for special construction of hubs, but more remains to be done before the advantages of standardization are realized fully.

In connection with this, the excellent work which is being done by the Engineering Standard Committee, the Society of Motor Manufacturers and Traders and this Institution must be recognized. They have recommended the adoption as British standards of the following six sizes of rim diameters for solid tires: 670 millimeters, 720 millimeters, 741 millimeters, 771 millimeters, 850 millimeters, 881 millimeters.

In regard to the question of tolerance in rim diameters, the society's committee has suggested nothing under, but one millimeter above, the standard diameter. The author regrets that he is unable to support this suggestion, in the light of his experience. It has not been found practicable to dispense entirely with the use of canvas packing between the tire band and the rim, and the internal diameter of the tire bands is frequently under the standard diameter. With a rim above standard diameter there is great danger of bursting the tire band while the tire is being pressed on, and the author is therefore of opinion that for the present it is preferable to make the rim tolerance nothing above, but one millimeter below the standard diameter.

Pressed Steel Wheels

The Sankey is another type of built-up wheel in which the two halves are pressed out of a sheet and subsequently united in the center plane of the wheel by acetylene welding. This makes a very nice-looking job, which appears to stand well when fitted with pneumatic tires, but the author has not found it satisfactory on solid tires for bus work, unless it was reinforced by a center plate. This addition makes a material increase in the weight of the wheel, and a further point against it is the higher cost of manufacture. Plated wheels, both plain and dished, are also used to some extent; these are, of course, well balanced, but are inclined to be heavy, and difficulty has been experienced in the junction of the plate with the hub, and also, in some cases, with the junction at the rim.

A very good type of plated wheel has been recently put upon the market by Ruston, Proctor & Co., Ltd., of Lincoln. In this design, Fig. 4, two circular plates are dished to a conical section, and the rim is formed by flanging the edge of the plate. The two dishes are united to each other by rivetting through distance pieces near the rim, and the plates are joined to the hub by long bolts. This wheel is superior to other forms of plated wheel in having the rim solid with the plate. The drawback, as with other plated wheels, is that it is about 50 per cent. heavier than is necessary.

Number of Tire Slots

The sub-committee of the Engineering Standards Committee expressed the opinion that to facilitate the removal of the tires, four equally spaced slots should be provided in the outer flange of the rim. The Society of Motor Manufacturers and Traders has subsequently recommended that for rims above 771 millimeters diameter six slots should be used. With this recommendation again, the author is unable to agree, experience having shown that four slots are sufficient for forcing off twin tires of 1050 millimeters.

As the cutting of the slots necessarily reduces the strength of the rim at these points, it is preferable to arrange them opposite to the spokes, so that the direct support obtained may neutralize the loss of strength due to the slotting. The number of rim slots is therefore related to the number of spokes in the wheel. Six spokes are insufficient except for light work, and experience has not shown that it is necessary to employ more than eight spokes even for loads up to five tons. Four rim notches suit an eight spoke wheel, but in order to have six rim notches each separated by a spoke, where more than six spokes are necessary, it is obvious that the wheel would need to be made with twelve spokes—which is more than is required and adds unnecessarily to the weight of the wheel and the cost of production. Four inches is a convenient width for the rim slots, and it is desirable that the ends of the slots should be raduised instead of having sharp corners.

In regard to the employment of retaining flanges or cleats, the author is convinced that if the tire is properly fitted to the rim and forced on with, say, not less than 50 tons pressure, there is no necessity for a retaining flange or for cleats. Neither the retaining flange nor the cleats will keep the tire on the wheel in the event of a fracture of the steel band forming the base of the tire. For town work the bolts for securing cleats or retaining flanges are frequently sheared

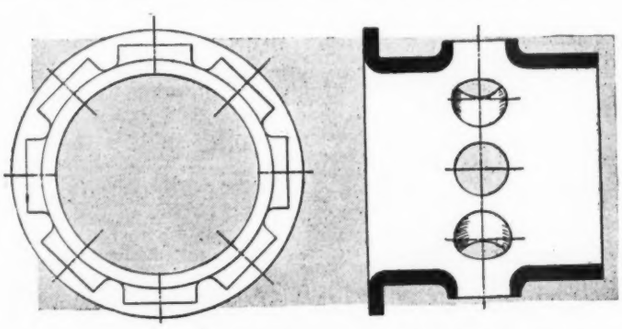


Fig. 3—Pressed steel hub of C.-M. wheel

by contact with the curb, and where there is much curb work the author thinks that it is preferable that no retaining flange or cleats should be used, and that the registering flange, against which the tire is pressed, should be put upon the inside; otherwise it is liable to serious injury by contact with the curb, and the notches in the flange are peculiarly liable to trouble of this kind, and are also liable to catch on the edge of the curb.

Plain versus Ball or Roller Bearings

There is considerable diversity of practice in the matter of the hub bearings—ball bearings, roller bearings, and plain bearings are all used. The ball or roller bearing requires less attention for lubrication, but the plain bearing is able to resist shocks with greater impunity. There does not appear to be much to choose in first cost between the ball or roller bearing and a properly constructed plain bearing. The plain bearing should be provided with hardened steel surfaces which are ground accurately to cylindrical shape after hardening. Between the hardened and ground surfaces is fitted a floating bush of bronze or gun metal, the said bush being drilled—usually spirally—to facilitate the flow of lubricant between the two surfaces.

The plan bearing needs to be regularly replenished with lubricant, or it will soon depreciate. The ball or roller bearing requires practically no additional lubrication after the first assembly, but it must be kept clean and dry or it will rapidly deteriorate.

The critical time for ball or roller bearings is when changing wheels, say, for tire renewals, as it is then that they are exposed, and if, as sometimes happens, part of the bearing slips out of the hub and on to a wet and dirty floor, and is replaced without first being thoroughly cleansed, depreciation is very rapid and serious injury to the bearing will result. The presence of water is particularly objectionable in either ball or roller bearings, owing to the corrosion which is set up destroying the surface of the races and the rollers or balls.

On the whole, the author is of opinion that the best results are obtained by the employment of roller bearings, one on each side of the hub, so constructed that the bearings are not exposed when the wheel is taken off, and that every part of the bearing is securely held together so that no part can fall out during the handling of the wheel. Standard designs of hubs are being developed on these lines.

Ball journal bearings are also able to bear considerable side thrust, but in the case of a roller bearing, side thrust must be provided for independently, either by the use of plain washers or preferably by the employment of properly designed ball thrust bearings.

The practice in the United States is generally in favor of the employment of cone roller bearings in wheel hubs, of the Timken or other somewhat similar patterns. They have the advantage of taking both journal and end pressure.

Tires on Soft Ground

A rubber tired wheel, being designed for use on a hard road surface, is at a disadvantage on soft ground or in snow. The surface of the tire has no tractive "bite," and the rotation of the driving wheels causes them to sink deeper into soft ground. This difficulty is constantly met with in handling the motor transport in France, and is due not merely to bad roads but also to the fact that the vehicles have frequently to be cleared off the roads into adjacent fields so as to facilitate the movement of troops. It is easy to imagine the condition of the fields in consequence of the heavy rains, and the author is informed that vehicles have in some cases been lost through sheer inability to get them back on to the road before the arrival of the enemy.

To overcome this serious difficulty, an attachment to driving wheels has been designed by one of the transport officers. This device consists of a series of steel rings which

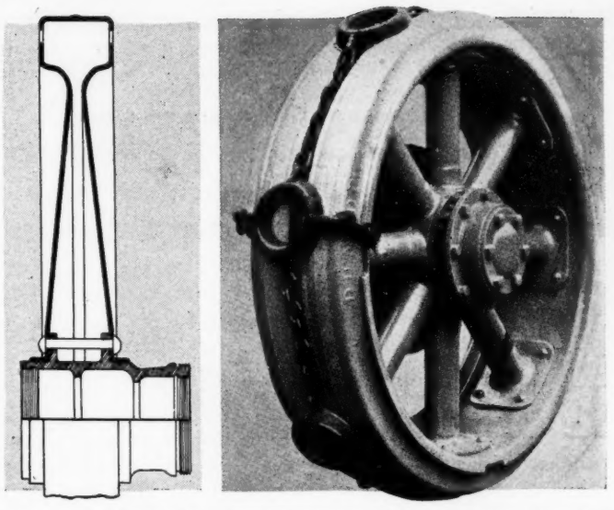


Fig. 4—Left—Ruston Proctor presses disk wheel that has half rim in one piece with disk. Right—Non-slip device used by army trucks for getting out of soft places

are secured to the periphery of the driving wheel by a central chain which is provided with turnbuckles. An anchor chain is also provided to prevent circumferential slipping. The device can be quickly attached and detached when required, and its reliability has been demonstrated in actual service; it is not suitable, and is not intended, for use upon a hard road surface. Fig. 4 shows a wheel fitted with this non-skid device, of which some thousands are now in use at the front.

Widen French Highways To Facilitate Army Motor Transportation

FRENCH national highways, leading from base depots to main points along the fighting line are being widened by the military authorities in order to facilitate the work of the army transports. Practically all French macadam roads are flanked by grass tracks, sometimes as wide as the road itself, on which trees have been planted at regular intervals. These tracks give pasturage to cattle when on the move and the trees act as a protector against sun and wind. Owing to the immense amount of traffic on the main roads, the grass tracks have been used by men and horses, leaving the center free for automobile convoys, until, instead of a smooth, trim grass surface, there is nothing more than a bed of mud.

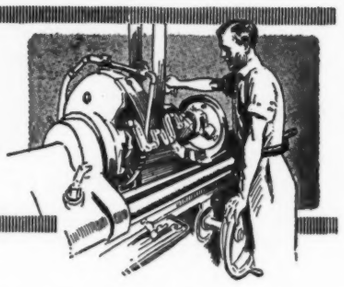
The military authorities, taking the work out of the hands of the department of roads and bridges, is now making the side tracks fit for traffic. Stakes are driven into the road and over these are placed wood beams or old railroad sleepers, laid longitudianlly. Logs are placed crosswise above the sleepers, at regular intervals of about 5 feet. A heavy layer of broken stone and sand is spread over this wood framework. The surface thus obtained is found entirely free for automobile traffic, comprising heavy convoys, fast touring cars, and troops being moved in buses and trucks.

The work of transforming the roads is being undertaken by the engineer corps in the army and by territorial troops who are officially considered to be resting; in other words, who are not in the actual firing line.

$787,083 in N. J. Automobile Fees

TRENTON, N. J., Jan. 23—New Jersey collected license fees from motorists totaling in 1914, $787,083, according to the annual report of Job H. Lippincott, commissioner of motor vehicles. Fines for violation of the law totaled $25,025. The commissioner reports the establishment of a rogues' gallery for automobilists.

The Rostrum



Installing the Center Ball Bearing

EDITOR THE AUTOMOBILE:—Please explain and show in a drawing in your next issue of THE AUTOMOBILE how to mount the center ball bearing in a three-ball-bearing crankshaft.

2—What would the piston displacement be for a motor 3 by 6?

3—Have the Mercedes, Benz and Delage companies American agencies?

4—What type of motor has Louis Disbrow in his racing car Simplex Zip.

St. Louis, Mo. F. SMITH.

—1—The installation of ball bearings on the main journals of a two-bearing crankshaft is not difficult, as they may be easily assembled in place and removed for examination when desired. The problem of supporting the center journal of a three-bearing, four-throw crankshaft is an interesting one that can be solved in a variety of ways. One which is used successfully by the New Departure company is shown in Figs. 1 and 2. The crankshaft is made in the usual manner except that the crank webs have rounded corners to make possible the installation of the ball bearing which must be passed over them. The bearing inner race is supported by a split or two-piece bushing which makes up the space between journal pin and bearing inner race. This is assembled after the bearing has been placed on the journal by pressing that member against one of the crank webs, thus leaving room enough at the other side to enable one to put the half bushings together around the shaft and then forcing them sidewise into the bearing bore. The bearing and bushing are then pushed to the center of the journal and the assembly is retained in place by clamping the two retaining and spacing rings (which are also in two pieces) around the shaft by suitable bolts. The bushing supporting the bearing inner race and the bearing as well are thus firmly held on the crankshaft. The outer race is a good pushfit in the crankcase housing supporting the center bearing.

Another method is that in which the diameter of the crankpin is increased at the point upon which the bearing is installed. The inner races are all securely clamped inwise, the outer races are all sucking fits and free endwise, with the exception of that at the center, which is held between shoulders with .01-inch clearance. This bearing rather than the one at the flywheel end is limited endwise because it is subject to the lesser radial load. The crankcase has the lip and groove end closure to prevent oil leakage in the common manner. Instead of clamping the inner races endwise by a nut, bolts lying in grooves in the wrist clamp the washers. These washers are horseshoe-shaped to facilitate placing.

Still another method is followed when the bore of the intermediate connecting-rod bearing is large enough to pass over the web. Halved bushes well fitted to the wrists are set on these; halved threaded bushes fill up the remaining wrist length, leaving a slight space. These halves are slipped on endwise over the web tops which do not project beyond the wrist diameter. Halved nuts with clamping lugs fit the threaded bushes. These nuts securely bind the inner races, tightening the clamping lugs and locking the nuts securely. Both the methods last described are used by the Hess-Bright Co., and with either successive bearings can have the same bore.

2—The piston displacement for a four-cylinder 3 by 6 motor would be 169.6 cubic inches; for a six-cylinder motor it would be 254.4 cubic inches. Displacement per cylinder, 42.4.

3—The Mercedes car is handled by Paul LaCroix, 3 East Fifty-second street, New York City. The Benz car is handled by the Benz Auto Sales Corp., 1696 Broadway. There is no American agent of the Delage car so far appointed of which THE AUTOMOBILE has any record.

4—The Simplex Zip has the regular 50-horsepower Simplex motor fitted up especially for racing. This is a 5.375 by 6.5 T-head job.

Thomas Receivership in 1912

Editor THE AUTOMOBILE:—Why did they discontinue making Thomas cars in 1912?

2—What was the general opinion as to the merits of the 1911 model 59.

3—What horsepower has it?

4—What is the market value today of this car?

5—What is the highest speed that can be obtained?

6—Can you tell me the functions of the torque tube?

7—What is consumption of gasoline per mile under normal conditions?

8—How can I take up the backlash in the shaft and differentials?

Lynn, Mass. JOHN R. COLEMAN.

—1—Thomas cars ceased to be manufactured in 1912 because the E. R. Thomas Motor Car Co., of Buffalo, N. Y., the maker, became involved in financial difficulties. The receivership of the Thomas plant resulted from action in equity brought by the creditors on the grounds that the company, while solvent, was temporarily unable to meet its obligations. The company was re-organized in 1911 and extension notes were given at that time. These fell due in August, 1912, and could not be met. The total amount was $250,000, out of which the holders of $210,000 agreed to grant a 3-months extension, but the holders of the remaining $40,000 declined and as a result Judge John R. Hazel in the United States District court appointed a receiver. In 1914 the reorganized Thomas company announced a new six which appears with refinements for 1915.

2—The Thomas has been regarded as a reliable car.

3—The rated horsepower of the 1911 Model M was 40 and that of the Model K 70.

4—According to the reports published by the Chicago Automobile Trade Assn. the value of the model M 1911 Thomas for a seven-passenger touring is now $430 and for the Model K $390.

5—The highest speed would depend on the condition of the car and its gear ratio.

6—The function of the torque tube is to take the strains that are imposed on the frame of the car in starting and in applying the brakes. Under these two conditions the axle housing tends to rotate and were the torque tube or some equivalent device not used the strain would be taken by the shaft. The torque tube generally incloses the driveshaft.

7—The consumption of gasoline per mile under normal conditions depends upon so many varying factors that no

general average can be given. It may be stated, however, that, with the moderate weight cars now in use, a mileage of 14 or 15 to the gallon is very common. With lighter weight cars this mileage may run up as high as 30 and with heavier as low as 4 or 6. It is impossibile to give a general mileage.

8—The only method of taking up backlash in the differential gearing is to replace the parts which are worn and which caused it. If there were adjustments to bring the teeth of the gears into closer mesh a small amount of lost motion could be taken up by utlizing this adjustment feature.

Asks Value of Steel Alloys

Editor THE AUTOMOBILE:—In your recent article on vanadium there was frequently mentioned such combinations as nickel-chrome-vanadium steel. I never see mentioned nickel-chrome-tungsten steel, tungsten steel being spoken of as simply tungsten steel.

1—What properties would be imparted to tungsten steel by the addition of nickel to the alloy? By the addition of the element chromium? of silicon? of manganese?

2—I also read in your magazine sometime ago that the National cars use silico-manganese steel for springs instead of carbon steel. What peculiar advantages are claimed for silico-manganese steel springs as compared with carbon steel springs? As compared with vanadium steel springs? I also note that silico-manganese steel is used for making gears. It seems to me rather strange that the same properties in a material that make it especially adapted for springs should also make it especially suitable for gears. How is this?

3—Do you not think that it would be well for the A. A. A., the S. A. E., or some similar body to officially weigh each model of each make, fully equipped, but with tanks empty, and to see that the correct figures are readily available to the public? Not only is the public entitled to reliable information on this point, but the remedy suggested would be a great boon to the automobile industry and business; for there would not be such a premium on dishonesty as at present, and the manufacturers of a really light car would be suitably protected in whatever advantages are rightfully due him. It seems too bad that the automobile industry and business, which in the main is highly legitimate and honorable, should be so sadly tainted with dishonesty in this one matter; and some such plan as I suggested would do a great deal of good in more ways than one.

Chicago, Ill. J. B. MCQUEENY.

—1—Nickel is added to steel to increase its elastic limit, its hardness and its ductility. It is generally used to the extent of 3.5 per cent. for forgings. The reason it is not generally used with tungsten in alloying steel is that the tungsten itself is a hardener. Tungsten is of value in combination with chromium and carbon in that it raises the temperature to which the steel can be brought without losing hardness. For this reason tungsten steel is known as high-speed steel. That is, the heat generated in high speed cutting does not soften the metal sufficiently to dull the edge of the cutting tool with the rapidity that would be the case were ordinary steels used. High-speed steel is chrome-tungsten steel and a typical composition is carbon .68 per cent. manganese .07 to .11, chromium 5.95 to 5.47, tungsten 17.81 to 18.19. The manganese which is present is added to overcome the effects of the sulphur and oxygen impurities. Silicon is a steel hardener and is not present because the tungsten fulfills this purpose.

2—The advantage of silico-manganese and vanadium-steel springs as compared to carbon steels is generally due to the

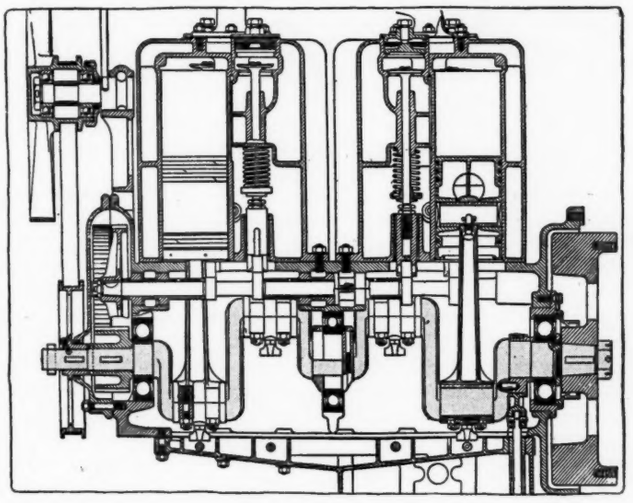


Fig. 1—Sectional view through motor showing a ball-bearing crankshaft installation

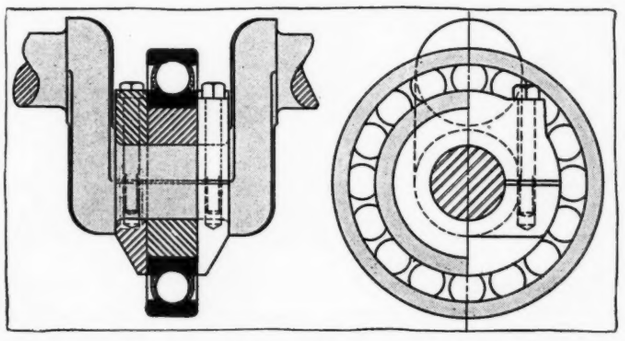


Fig. 2—Detail of center ball-bearing mounting for a three-bearing crankshaft

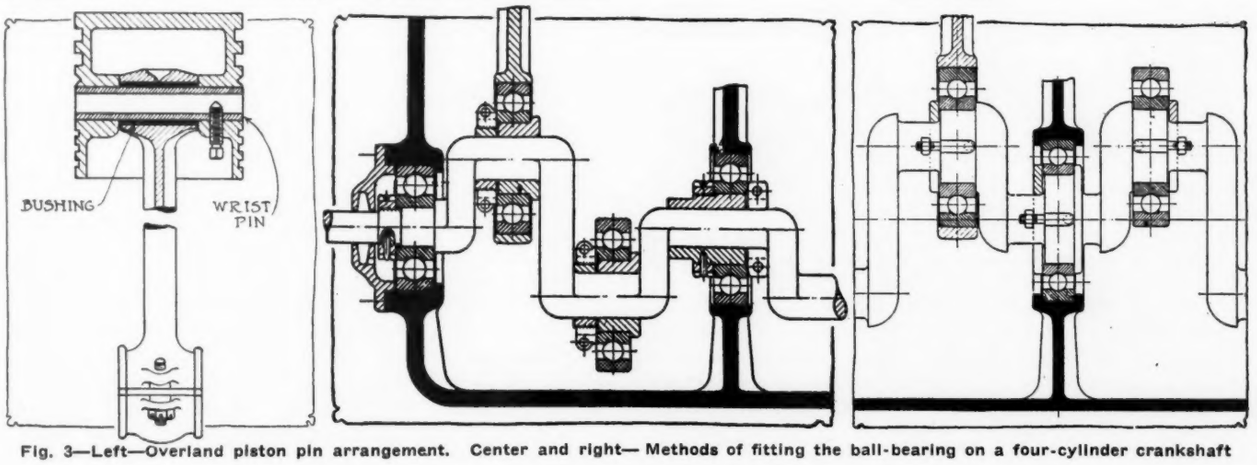


Fig. 3—Left—Overland piston pin arrangement. Center and right— Methods of fitting the ball-bearing on a four-cylinder crankshaft

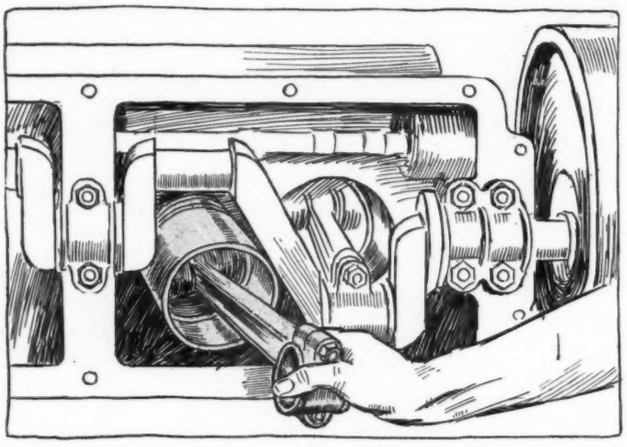


Fig. 4—Method of withdrawing piston and connecting-rod assembly after the bottom half of the crankcase has been removed

prolongation of life of the spring. Every spring or any piece of steel has just so many possible vibrations before its life is terminated. The purpose of using the silico-manganese and vanadium alloys is to raise the possible number of vibrations. The reason the alloys you speak of are used for making gears is that they tend to harden the gears and hence reduce the wear.

3—It cannot be doubted, but that a standard method of weighing cars and of securing reliable data on this subject would be an advantage.

Repairing Overland Piston Pin Bearing

Editor THE AUTOMOBILE:—What is the best way to get at the wristpin bearings in an Overland model 79 so that they can be tightened.

2—Is half kerosene and half wood alcohol a good carbon remover for Pope-Hartford cars?

3—Has the Paige-Detroit car direct drive?

4—The Pope-Hartford cars are very hard to start in summer and almost impossible to start in winter. Is there any way to start them easily?

Falls Village, Conn. F. S. S.

—1—The wristpin on the model 79 Overland is not adjustable. The pin itself is a hollow hardened steel piece which bears against a solid circular bronze bushing as shown at the left, Fig. 3. When wear has increased to such an extent that there is a knock at this bearing the method which you will have to follow will be to remove the piston, drive out the piston pin and remove the bushing. The worn bushing and piston pin are then replaced by new ones. This will cost 80 cents. The wristpin is 30 cents and the bushing 50 cents.

The method of removing an Overland piston is to take off the bottom half of the crankcase and then remove the connecting-rod bearing cap from the rod attached to the cylinder which it is desired to remove. The bearing cap is held by two bolts fastened by castellated nuts. When these are removed the rod can be swung to one side out of the way of the crankshaft and the entire assembly withdrawn from the cylinder in the manner illustrated on this page, Fig. 4. The pin can then be driven out with a punch after which the bushing can be readily removed. The new parts are replaced by simply reversing the above directions.

2—Half kerosene and half wood alcohol is a good carbon solvent and may be used to good advantage in the Pope-Hartford car. After taking the carbon from the cylinders the oil in the crankcase should be renewed in order that the lubricant will be in good condition.

3—The Paige-Detroit has a direct drive on top speed at which point the reduction is 4 to 1; this being the ratio in the rear axle. The car referred to is the touring model.

4—There may be any number of reasons why the car is hard to start. The only way to arrive at the cause is by process of elimination. There are three important factors in starting a car; namely, compression, ignition and carburetion. The first, compression, should be good. If it is not the possibilities are that the piston rings are leaky, that the valves need grinding; that the spark plugs and other cylinder connections are leaky, admitting air into the cylinder, or that the cylinders and pistons are gummed with carbon.

Ignition must be good for starting, since the spark is produced under the adverse condition of a slow rotative speed. To test the ignition, remove the plugs and lay them upon the cylinders. Crank the engine at approximately the same speed that you use in cranking to start, and observe the sparks. If they are all good and snappy, it is fairly certain that ignition trouble is not bothering you. If the sparks are poor, or do not occur at all, it will be a matter of tracing back trouble in the ignition system.

The proper carburetion for a start is that in which an exceedingly rich mixture is provided. With the later carbureters it is almost universal practice to provide an air shutter which will cause the suction of the motor to fall on the gasoline jet drawing practically raw gasoline into the cylinders. If your carbureter is so provided this phase of carburetion is taken care of but if it is not, the adjustment for low speed should be altered so as to provide a sufficiently rich mixture for starting. Proper starting carburetion is often interfered with by leaky manifold connections which permits air to enter the intake thus weakening the mixture. All gaskets and joint connections in the intake line should be kept tight. If your compression is good, the spark what it should be, and, a rich mixture introduced into the cylinders, you will have no trouble in starting even in cold weather.

Detroiter Motor Is L-Head Block

Editor THE AUTOMOBILE:—Will you please tell me what type of motor is used in the Detroiter car. Has it a two-bearing crankshaft fitted with ball bearings?

New York City. H. D.

—The motor used in the Detroiter car model C is an L-head block with the valves on the right. It has a bore of 3.5 inches and a stroke of 5. It is cooled by thermo-syphon and oiled by splash. The crankshaft is carried on two ball bearings.

Wants to Remove Nickel Plate

Editor THE AUTOMOBILE:—I would like to know what to use to take off different kinds of re-nickeling that I have used on the brass parts of my car. Something that will restore and not harm the original brass surface.

Albion, Nebraska. W. B. MARTIN.

—The coat of nickel which is deposited over the brass will have to be eaten off by acid or else scraped off mechanically. The acid will have a more even action and is recommended by large brass companies. The acids used are a mixture of nitric and sulphuric in even quantities. After the acid has eaten through the nickel it will leave the brass and then the acid is washed off and the brass repolished. To get a very good job it would be better to have the brass rebuffed.

Washing Soda for Radiator Cleaning

Editor THE AUTOMOBILE:—I have been having trouble getting the water to circulate through our 1910 Packard radiator. I have put pressure on it with a hose but the water went through only very slowly. I did this a number of times and there did not seem to be any loose sediment of any kind coming out of the radiator. I have heard that washing soda dissolved in boiling water will clean it, also boiler compound. Can you advise me regarding this?

Hyannis, Mass. C. A. MURRAY.

—Common washing soda dissolved in boiling water is an excellent remover of the scale that forms in the radiator. The radiator should be thoroughly flushed out with a solution consisting of about two heaping handfuls of soda to an ordinary pail of boiling water. The soda solution should be allowed to remain in the radiator for a short time and it should then be flushed out with clear warm water.

It is inadvisable to use boiler compounds in automobile radiators unless the constituents of the compound are well known. Some of the boiler compounds contain ingredients which corrode any metal surface with which they come in contact. The result is that instead of merely removing the scale the metal itself is decomposed and in a short time the radiator becomes leaky.

Oil Reaches Combustion Space

Editor THE AUTOMOBILE:—We would appreciate your telling us how to correct the oiling system in a new car which has given trouble since it left the factory. The car has been driven 3,000 miles so by this time should be thoroughly "worn in." The trouble is that oil works up into the first and fourth cylinders.

Somerset, N. Y. FROST BROTHERS.

—Faulty piston rings seem to be the only condition which would give the oiling trouble you mention. It may be that the joints of the rings which are of the ordinary eccentric type, have become aligned leaving a passageway for the oil to enter the combustion space. Another possibility is that you have too much oil in the crankcase which causes a greater supply than necessary to be thrown up. It would seem that the best step to take would be to remove the pistons and examine the rings on the cylinders that give the trouble. The pistons can be removed by taking off the lower half of the crankcase, removing the lower connecting-rod bearing cap and withdrawing piston and connecting-rod assembly. A replacement of the rings should eliminate the difficulty.

Building a Light Narrow-Tread Car

Editor THE AUTOMOBILE:—I am sending you a drawing, Fig. 5, of a light car that I am building. It is of the underslung type; is 105 inches long and has a tread of 48 inches. I am going to use 28 by 3 wheels and have a 20-30 horsepower motor. It will have a 10 3-4 inch road clearance and the transmission is a three-speed sliding gear and reverse. If I use a 48-inch tread, rear axle of the racing type that is used in the Tiger light car, 3 to 1 gear, would a 20-30 horsepower motor be too much for it?

Ft. Wayne, Ind. EDISON DALE.

—A motor producing 30-horsepower would not be too much, provided that the gearbox and transmission parts were designed to accord with this power. The question of tiring should be settled after the design had been layed out to a sufficient extent for you to be able to determine the exact load on each wheel.

Would Like Metric Measurements

Editor THE AUTOMOBILE:—The S. A. E. is to be warmly congratulated for its efforts towards the regenerating of the American standards. The results already obtained are very encouraging, yet the great work ahead for the S. A. E. calls for a large amount of foresight as well as energy in order that the final achievement be permanently useful. It is obvious that the entire work of establishing new standards should be started from a simple and reliable base, so that the system of standards (measures, weights, etc.) once laid out, should remain a solid and permanent monument to American engineering. An ideal system exists already and is, besides, very much in use throughout the world. It is the metric system.

We realize that our present system of standards and measures is antiquated and unreliable and that a change is very much needed. Why not adopt the metric system? It would be then a surprisingly easy matter to establish standards that would not only fit our own needs, but would tally automatically with the standards of the other nations that have already adopted the metric system. Sooner or later, the United States will have the metric system, and the sooner the better, so why not now? It is encouraging to note that we are favoring its introduction here.

We popularly give now the fractions of an inch in decimals, we are gradually getting used to hear about centimeters, millimeters, cubic centimeters, etc. For a multitude of reasons, it is now more timely than ever to seriously consider or discuss the possibility of adoption of the Metric system by the United States. That question is no small item since so stupendous a change would necessarily require a large amount of work and the co-operation of the entire American nation.

The history of the metric system, which is of French origin, is a remarkable one. Before its creation the French unit of length was the "toise," about equal to the English yard. At the time of the French Revolution, two engineers, Mechain and Delambre, were entrusted with the task of measuring one-fourth of the length of a terrestrial meridian. They found this meridian to measure so many thousand toises. They divided that number of toises into exactly 10,000 parts and called each a meter, the base of the whole metric system, as all other measures are derived from it. It is verily a simple scientific system, and it is derived from the very earth on which we all live. Therefore, it ought to be good enough for any nation. Its great simplicity won for it immediate favor and it is today adopted almost universally, the English speaking countries being a sorry exception.

Arcadia, California. CHAS. VINER.

—What would be a simple matter as far as actual measurements are concerned, would be far from simple when it came to replacing all our present dies, tools and fixtures by millimetric devices. It is hardly possible to conceive the enormous expense to which manufacturers in every phase of the industry would be put in replacing their present tools by those of metric dimensions.

This matter has been brought up and discussed from time to time and it has always resulted in the discovery that it would be impossible to secure concerted action by all our manufacturers because there would always be many who would feel that it is impossible to go to the expense of replacing their expensive machinery by that using the metric measurements.

Motor Speeds of Franklin Car

Editor THE AUTOMOBILE:—How many r.p.m. should the motor of the latest Franklin touring car make respectively at speeds of 20, 30, 40 and 50 miles per hour on high gears?

Oakland, California. A SUBSCRIBER.

—The wheel revolutions of the Franklin 6-30 touring car at speeds of 20, 30, 40 and 50 miles per hour on high are respectively, 197.8; 296.6; 395.5; and 494.4. Since the gear reduction on high gear is 3.7 to 1, the revolutions per minute of the motor are respectively 731.86; 1,097.42; 1,463.35; and 1,828.28.

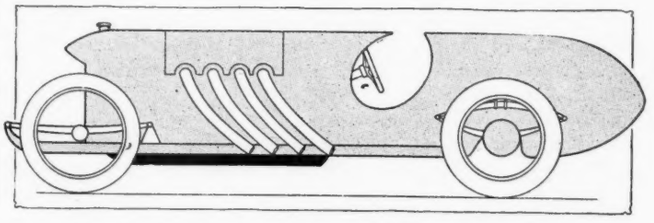


Fig. 5—Car body designed for light high-speed work

The Improvement of Spring Systems--V

Points worth noting in charts recording frame and axle movements in an automobile with spring and tire equipment—preliminary to figuring out corresponding action for springs and hard tires

By M. C. K.

(Continued from issue of January 7, 1915)

ATTEMPTING to bring to book, timed and measured, the movements and shocks which occur when vehicle springs are actuated through the wheel impact with a hump in the road, one feels the need of actual test records for checking the correctness of reasoning, as the subject is rich in elusive complications and one has to deal with very small time elements in deciding, for example, whether at a given moment after a shock has been received the vehicle frame and body will move in the same direction as the axle or against it—upon which, again, may depend the suitability of any proposed remedy for faulty action. But test records are not easily obtained. Instruments for recording graphically the jolting of a vehicle are not often used and have in most instances been arranged to show the relative movements of frame and axle and the highly effective quieting of these movements which results if some sort of spring regulator device is employed. But neither comfort nor safety depends upon making the axle and the frame move in unison; on the contrary, the axle must follow the uneven road surface, except in so far as tires or spring wheels or vehicle speed will permit deviations, and the frame should follow its own level in so far as possible. Such instruments also fail to indicate the severity of shocks which are not translated into movement—and thereby allayed—and are in fact based, it seems, upon the false theory that shock is indicated, in the case of a vehicle, by the extent and suddenness of vertical movement, or the stopping of such a large movement, or else upon the idea that shock is preferable to bouncing, which is contrary to the whole purpose of spring suspension. It may be said that the large movements indicate a sharp acceleration or retardation and that acceleration and retardation are commonly accepted as the only causes of shock; the instruments, by showing the movements in one case and their suppression in another, might on that theory be supposed to record the shocks and their avoidance indirectly, were it not that the ideas have become twisted, the movements really indicating the cushioning of shocks, though perhaps in a wrong direction, and the suppression of the movements indicating a condition under which the shocks may be simply endured though they may also have been dissipated by friction. The confusion arises perhaps from failing to distinguish between useful movements, necessary for cushioning an impact, and useless bouncing due either to reactions following the storing of a shock in spring tension or to misdirection of a cushioning movement. At all events, the records of the instruments are inconclusive.

No Direct Shock Records

It is, further, notable that the worst shocks to which vehicles are subject escape adequate and proportionate recording by means of a stylus, even if such a stylus floats between two sensitive springs, as they depend upon the horizontal movement of the vehicle being transformed by an obstruction into a very small vertical movement plus a severe shock, through the absence or momentary inaction of elastic elements. This sort of shocks are those which springless vehicles and the running-gears of vehicles with hard tires constantly receive, but they also occur when springs are too stiff and—this being the most practical instance—when a shock is received at a moment when springs of suitable flexibility are stiffened by strong compression resulting from a previous shock and ungoverned spring action.

As acceleration or retardation in these instances (which the instruments show only as a small movement in each case) is also scarcely recognizable, being veiled in a change of direction, nothing has probably been gained for a wide understanding of the subject by insisting that acceleration or retardation is indispensable for the production of shock, as it is only in a highly scientific sense that either measures proportionately the shocks which are most destructive or disagreeable.

Instruments Wanted

Briefly, the instruments so far used on the road for demonstrating the efficiency of spring devices, record only movements but not forces which are spent destructively, and the movements are not the important ones. The movements of prime interest are those of the axle and those of the frame or body in relation to the road, and those of the axle in relation to those of the frame are secondary. The latter may be constructed on paper if the former are known, but not *vice versa*, as the road level is not disclosed by a chart of the relative axle and frame movements. Fig. 10 shows on a smaller scale the exaggerated relative axle and frame movements corresponding to the more important movements relatively to the road level which are represented in Fig. 9.

As said in the beginning, test records showing the important movements would greatly assist in analyzing the requirements, and those wanted at the present stage of the examination should preferably refer to vehicles with hard and unelastic tires, normal springs and the shocks and movements caused by a road obstacle about 3 inches high at a vehicle speed of about 35 miles per hour, so as to furnish a direct comparison with the results figured out for these conditions. The best records available are, however, those produced by Dr. Bobeth for a car with pneumatic tires passing over an obstacle about 1 inch high and shaped as the shaded space in Figs. 9 and 11. The dimensions of the obstacle are not recorded explicitly but may be inferred from the tire action shown in the diagrams.

The Accompanying Charts

The speed for Fig. 9 is 22 kilometers (13.60 miles) per hour, which is found to result in more bouncing of the frame —when pneumatic tires are used—than either lower or higher speeds, and the speed for Fig. 11 is 75 kilometers (46.50 miles) per hour. The horizontal extension of the diagrams represents space, not time, so that the time scale is nearly 3 1-2 times smaller for Fig. 11 than for Fig. 9. In order to visualize the difference in the horizontal and vertical scales, the obstacle, which is indicated in true relations to the oscillations by dotted line *c* at the beginning of the curves, is represented in its true shape in the shaded space which has otherwise nothing to do with the charts. In the original records the curve *b* of the frame movements is drawn on the same base line as the curve *a* of the axle movements, and this is also done in Figs. 9 and 11, curve *b* being dotted, but in ad-

dition curve *b* is shown in full line at an arbitrary distance above curve *a*, so as to indicate the oscillations of axle and of frame more nearly in the relations to which the eye is accustomed in the direct observation of a vehicle.

Spring and Tire Interaction

By looking over these charts it is perhaps first observed that the axle movements are dominated by the influence of the pneumatic tire, and secondly that this influence seems much more favorable at the high speed, Fig. 11, than at the low speed of 13.60 miles per hour, Fig. 9, where the tire gets time to react against the wheel before this has reached the middle of the obstacle and throws the axle to the point D, which is at least high enough to take the load off the tire while it clears *c*. All the portions of the axle curve *a* lying below the original axle level represent of course solely tire compression, in excess of the tire compression due to the static load, and it can be seen that the cushioned blows against the ground which they indicate are caused largely by spring extension. The locations of E, E_1 and E_2, Fig. 9, which are the points where the axle curve intersects the frame curve before the latter reaches N, show this to be the case; for at these intersections the axle and the frame are in their initial relations, but as they are above their starting levels, the load is removed from the spring, and the latter is left free to extend, which it does with considerable force, since at E it is coming back from D, anyway, with the recoil of its first compression and the frame is going up at the same time. It is noticed that not only the first but also the second axle oscillation contributes to raising the frame to N, and that the second spring extension (from E_2 to the base line plus simultaneous rise of frame) is almost as marked as the first one (from E to the same line plus rise of frame). The descent of the frame from N does not begin till after the second spring extension is finished and then proceeds from N to P under the combined effect of spring recovery and gravity and gathering momentum toward P, thereby in turn compressing spring and tire after E_3 and causing their last oscillations. It is noticed that the spring compression after E_3 is very considerable, being indicated on the chart not by the height of the axle alone but also by the drop of the frame, in fact by the extent to which dotted curve *b* dips below curve *a* between E_3 and E_4. The oscillations of *a* are here evidently due to tire action after frame drop H to P.

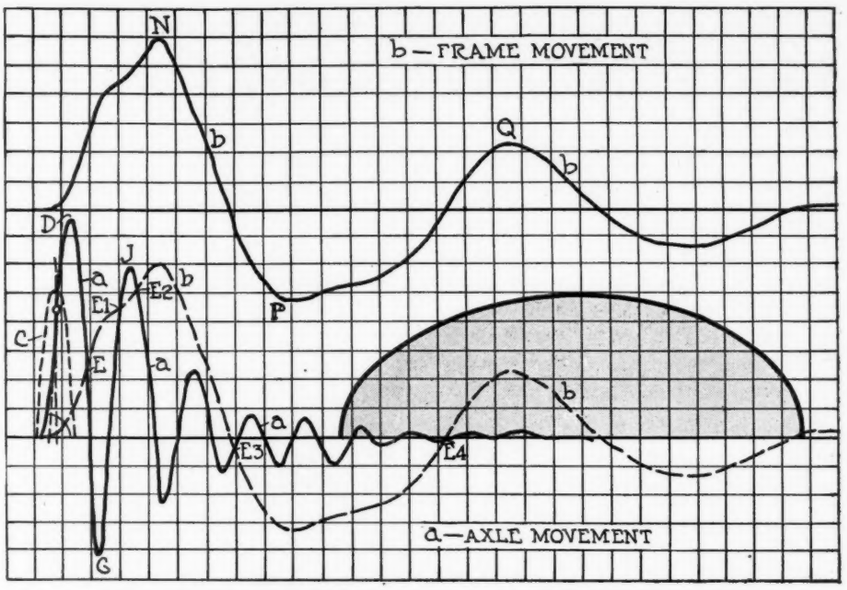


Fig. 9—Frame and axle movements, as measured from their levels at rest, for car equipped with springs and air tires when passing over a given obstacle at 13.6 miles per hour

Fig. 10, giving the chart of relative frame and axle movements, shows the succession of spring compressions and extensions directly by the vertical distance of any point in the curve from the line AE; compression above this line and extensions below it.

But while it is possible to some extent to separate, in these charts, the indicated movements into spring movements, which affect the frame, and tire movements which affect both the frame and the axle levels, it is scarcely possible to point out how the spring and the tire mutually affect the movements of one another. This must be done either by test records similar to Figs. 9 and 11 from a vehicle with hard tires, which would be preferable, or by figuring from assumed data. For lack of tests the latter method must be used.

Effects of Speed

Fig. 11, considered as a time schedule, corresponds only to the first portion of Fig. 9, as far as E_3 in that chart, but covers the same distance of vehicle travel, approximately 8 to 10 feet.

The points of greatest interest in Fig. 11, apart from those it has in common with Fig. 9—for example that two spring compressions, the last one at J very slight, and two tire compressions take place before the frame lift reaches maximum at N—are those due to the higher speed of the vehicle. It is seen that the speed makes the wheel clear the obstacle without raising the axle as much as the height of the obstacle amounts to, this meaning, of course, that the obstacle becomes deeply imbedded in the tire by reason of the force of the shock, and the vehicle is past before tire rebound takes effect. The frame does not begin to rise until the first spring and tire compression is finished at D, and the spring compression is evidently much smaller than the tire compression—and smaller than in Fig. 9 at lower speed and lighter impact. The location of G in comparison with D shows that the tire action predominates. Finally, in harmony with the small spring action, the frame movement at its maximum at N is only about one-half that of the axle movement and much smaller than in Fig. 9, but the maximum at N is reached, as before, at a moment closely coinciding with the maximum of the second spring and tire extensions; and these nearly coincide with one another.

Plainly, a much larger portion of the shock is absorbed

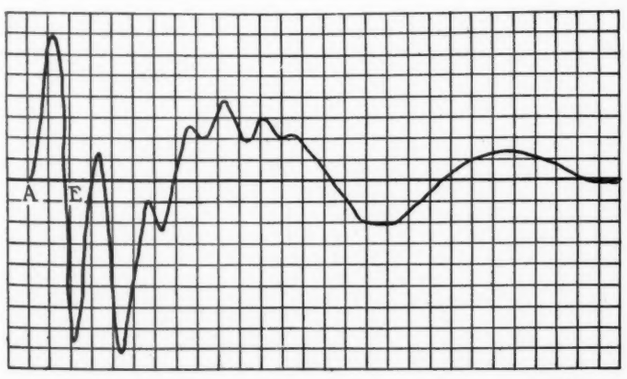


Fig. 10—Relative movements of frame and axle, under conditions of Fig. 9, showing successive spring compressions and extensions

in the pneumatic tire (with standard inflation) at 46.5 miles per hour than at 13.6 miles, though the two shocks are in the proportion of 46.5^2 to 13.6^2, or about 10 to 1, so far as the horizontal components are concerned and perhaps more than 4 to 1 for the vertical components. And by virtue of the rotation of the wheel a very large portion of the elastic reaction from the tire shock is released in heat and in stresses converging toward the center of the wheel from all sides, so that the springs are greatly relieved from work. This effect discloses the truly magic value of pneumatic tires as shock absorbers under the conditions of speed, inflation and shape and size of obstacle which obviate tire reaction against the springs, and it stands to reason that similar effects in lesser degree are produced by elastic tires under less favorable conditions.

The Unceasing Tire Work

They are paid for in the very considerable demands upon the propulsive power which such tires—and all other rotary springs—make on smooth ground by the continuous flexing and unflexing of their fabric caused by the load and the rotation; a drawback which does not apply to vehicle springs and which suggests the desirability of developing the spring system so highly that air tires may be used at a high inflation, to reduce this loss of power occurring when the tires are least needed, as well as the wear which the tire flexions involve.

Equipment for Desirable Tests

So far, no means have been found for calculating the amount of shock force which the elastic tire, especially the air-filled tire, can actually store and release harmlessly to save the springs, and all figuring of shock stresses and movements must therefore cease when there is question of vehicles equipped with such tires. A great work remains to be done in tabulating these effects for different sets of conditions by experiment. A sheave capable of rotation at predetermined speeds, obstacles of different shapes and dimensions attachable to the sheave, provision for a lateral displacement of the sheave to take the obstacle out of the wheel plane after the wheel has passed over it, a wheel which can be equipped with different tires, springs of different flexibility and differently loaded to hold the wheel against the sheave, and a simple registering device to record the spring compression with the load fixed as well as with the load subject to the spring action—these would comprise all the essentials of a testing equipment by which the data might be produced.

Comparison of Fig. 9 and 11 shows, however, that the maximum benefits of the air tire are very closely associated with both high speed and small size of the obstacle, and uses of motor vehicles for which these factors are unimportant are so numerous that the problem of designing spring systems which shall act acceptably without the assistance of air tires becomes a greater one, at least economically, than that of devising the most suitable system for making air tires and the spring system support one another, and it remains probable that the spring system best suited to work alone will also be best suited to co-operate with air tires for the highest degrees of speed, comfort and security. The factors coming into play for such spring systems must be subject to at least approximate calculation, not only with regard to the movements of springs and vehicle parts, but also with regard to those shocks that remain despite the easing by the springs; and these are not ordinarily plotted when the effectiveness of a spring arrangement is under discussion.

That an obstacle so broad (such as the ordinary wave in a road) that tire reaction will take place before its summit is reached, or one so high (such as 3 inches) that only the smaller portion of it can become imbedded in the tire, would make the curves of Fig. 11 look a good deal like those of Fig. 9, and especially would greatly increase the frame lift at N, seems clear without argument. On the other hand, it has been demonstrated by tests that reduced air pressure in the tires would make the curves of Fig. 9 more acceptable but would involve much increased loss of power from tire flexions on smooth ground as well as stresses and wear of the tire fabric which the latter is not adapted for withstanding properly.

Braking the Wrong Movements

Finally, it has been shown by test records that the great superfluity of movements evidenced in Fig. 9 as occurring after those which are directly useful and necessary for surmounting the obstacle can be considerably reduced by the use of spring regulators—dampers and rebound checks—so that the charts do not represent the best that can be done with means at disposal. But these test records still leave it in doubt whether the suppression of movements accomplished by the auxiliary devices is not bought at the cost of shocks taking their place, if not in all cases at least under certain combinations of road and speed conditions, and the shortest way to insight in the methods which will serve acceptably for any given practical purpose—comprising all the work of any given vehicle type—remains a systematic examination of the movements and shocks, or alleviations of shocks, caused by each element of a spring system. Among these elements the ordinary vehicle leaf springs come first, and Figs. 9, 11 and 10, though they include tire action, give a good preliminary idea of the many different ways in which vehicles may react under road shocks and of the factors to be considered before means for effecting a desirable uniformity in these reactions can be evolved—the greatest of all devices for this purpose, the air tire, being after all only an admirable makeshift working very differently under different conditions.

That the spring system of 1925 may become as far superior to that of 1915 as the motor of 1915 is superior to that of 1900, if a similar amount of work is expended upon the improvement of the spring suspension as has been spent on the design of motors, is taken for granted by many. And the number of spring suspension workers is steadily increasing. Systematic test records would speed their efforts.

(To be continued)

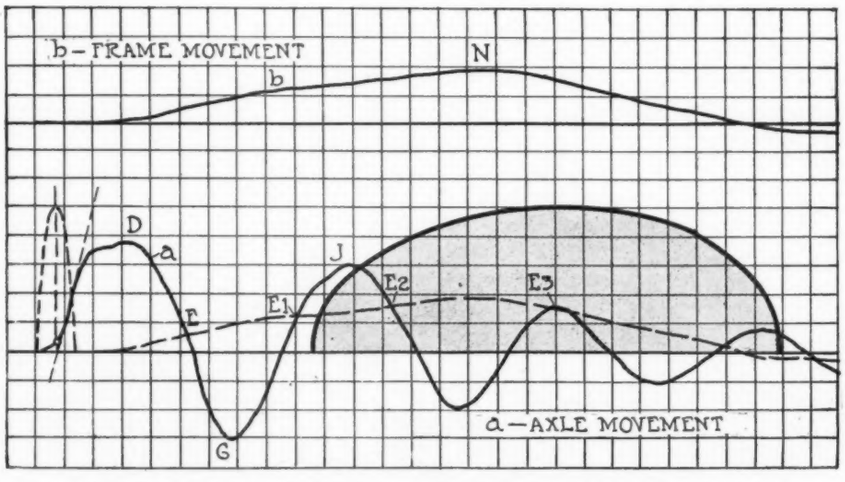


Fig. 11—Frame and axle movements, as measured from their levels at rest, for car equipped with springs and air tires, when passing over a given obstacle at 46.5 miles per hour

Duplex Carbureter for Eights

Zenith Introduces New Model for Independent Supply of Gas to Each Cylinder Block—Single Float Mechanism and Only One Throttle Connection

THAT the Zenith Carbureter Co., Detroit, is keeping abreast of the times is evidenced by its announcement of a special carbureter for eight-cylinder V-type motors, which maintains all the Zenith features and is similar in construction to the horizontal type brought out by the concern about a year ago. In the new model there are two outlets to the intake manifolds, one for supplying each set of four cylinders, and two throttles. The latter are interconnected, so that the usual throttle lever and accelerator will act to open or close both simultaneously.

Two Mixing Chambers

Referring to the illustrations, Fig. 1 is an external view of the device, while sections are shown in Fig. 2. It will be seen that there are two entirely separate and distinct mixing chambers with their jets and throttles, these both being supplied from a float chamber, which, with the float mechanism, is common to both. It might be considered that each is a complete carbureter for four cylinders except that only one float chamber is used, and there is also only one air intake, this supplying both mixing tubes. The mixing chambers are horizontal, with the jets entering the venturi section at right angles, so each outlet attaches to the intake connection without bends.

Two Concentric Nozzles

The main feature of the Zenith carbureter is the combining of an ordinary nozzle with another from which the flow is independent of the suction of the engine. These two nozzles are concentric, the ordinary nozzle, or main jet M, obtaining its gasoline from the float chamber through the passage C. It is surrounded by the jet J, which is supplied through the passage N from the well. This well is open to the atmosphere and gets a measured flow of gasoline through the compensating hole D which is not subjected to the suction and, has, therefore, a steady flow. The main jet, if used alone, would give a mixture of which the richness would be in proportion to the speed, and therefore the suction. At low speeds the suction is low, and therefore the mixture would be lean and at high speeds when the suction is greater, too rich a mixture would result. To compensate for this the outer jet lends its strong support to the main nozzle at low

Fig. 1—New Zenith carbureter for eight-cylinder V motors

suction, when it is most needed, and withdraws it gradually as the main nozzle gathers in strength with the increasing suction.

Slow-Speed Arrangement

The slow-speed arrangement is also a feature of the Zenith construction. It is composed of the idling tube X, of which the lower end is so sloped as to receive the coned upper end of the idling tube Y. This tube Y can be screwed up into the end of X, more or less, by means of the knurled tube Z. This provides for adjustment of the mixture going through the tube, since air can enter at the base of tube X through holes drilled in adjusting tube Z.

The tube T connects the idling tube X with the carbureter mixing chamber near the throttle, by means of the intervening passage T_1. At starting, the suction at the throttle is very powerful, and fuel is drawn up from the well through the nozzle of Y and idling tube X, at the bottom of which it mixes with air entering through the holes in the lower part of Z. The mixture is thereupon atomized, and sprays into the carbureter just behind the throttle and near the end of the mixing chamber. This gives a good starting mixture, and, as the throttle is opened wider, the compound nozzle comes into use and the starting jet goes out of action.

Interchangeable Nozzles

The standard Zenith features of interchangeable nozzles to fit any type of motor, metallic float with overhead float action and removable venturis is retained for the new design. The common air intake is shown at A and the mixing chambers open off it on opposite sides.

The interconnection of the two throttle levers is shown at B, while the hole B_1 provides the means of attachment to the control rods. As the illustrations show, there are two complete sets of compound nozzles, two slow speed nozzles, and everything which has to do with the vaporization and mixing of the fuel is in duplicate, so that the generation of gas will be in accord with the demands of both sets of cylinders, in the V between which the carbureter is intended to be placed. The horizontal design should prove very convenient in this position.

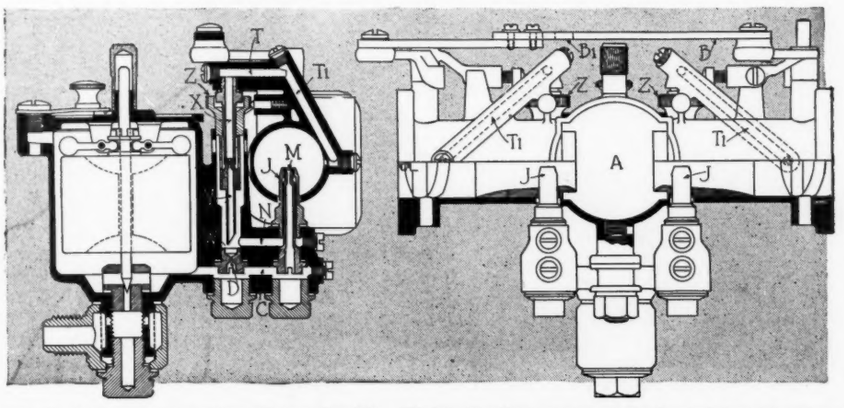


Fig. 2—Left—Cross-section of new Zenith. Right—Section, showing duplex mixing chambers and the pair of jets

Starting and Lighting for 1915

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Part II

DELCO equipment for 1915 is slightly more simplified and lighter. This is a single unit system consisting of starting motor, generator, and timer and distributer. Each installation is a special design and therefore there are no stock models. The 6-volt, single-wire system is standard.

The generating characteristics have been changed so that the maximum output is reached between 15 and 18 miles per hour. In general, current regulation is obtained by the use of a field rheostat. A special resistance wire is wound on a spool of non-inflammable material and mounted in the distributer housing back of the condenser. The regulation is effected by an arm which is operated by the distributer shaft. This arm is caused to move by the centrifugal force of the weight to which it is connected and when the arm is in the raised position the resistance is in series with the shunt field, thus decreasing the current and consequently cutting down the charging rate at high speeds.—Dayton Engineering Laboratories Co., Dayton, O.

National Combines Ignition

A combination ignition and lighting generator, and a starting motor are made by the National Coil Co., Lansing, Mich. The former appears in two models, one for four- and one for six-cylinder motors. The starter is made in two sizes also. Six or 12-volt systems are made as required.

The generator, shaped like a magneto, has the breaker box and distributer at one end and produces a 6-volt current and will carry the average lamp load when the car is running at 8 to 10 miles per hour.

A feature of this machine is the provision for increasing the output in cold weather when the efficiency of the battery is reduced, which is done by changing a screw plug on the front plate of the generator. The field windings are protected from excessive current by a fuse located on the front of the machine. The four-cylinder lighting generator runs at crankshaft speed and the six at one and one-half.

Few changes are noted in the generators except that the regulation on the six is now a constant-current system in which a vibrator is used. This instrument has also been reduced in height about 1 inch. In the four, current regulation is by means of a third brush.

The starting motor is a series-wound type, cylindrical in shape and at the brush end there is a removable, waterproof cover which gives access to the brushes.

Additional torque is a feature of the new starters and a reduction in diameter of .25 inches has been made. A cut of 7 pounds in the weight is the result of substituting aluminum castings for iron. Various types of drive are used, the worm being the commonest.

On a four-cylinder motor 4.12 by 4.5 inches, the starter will crank the motor at a speed varying from 120 to 130 r.p.m., depending on the tightness of the different parts of the engine. The current consumed while cranking this motor will be approximately 125 amperes at 6 volts.

In conection with the lighting system the company makes a unit switch which contains the ammeter, relay, and switches for lights and ignition.

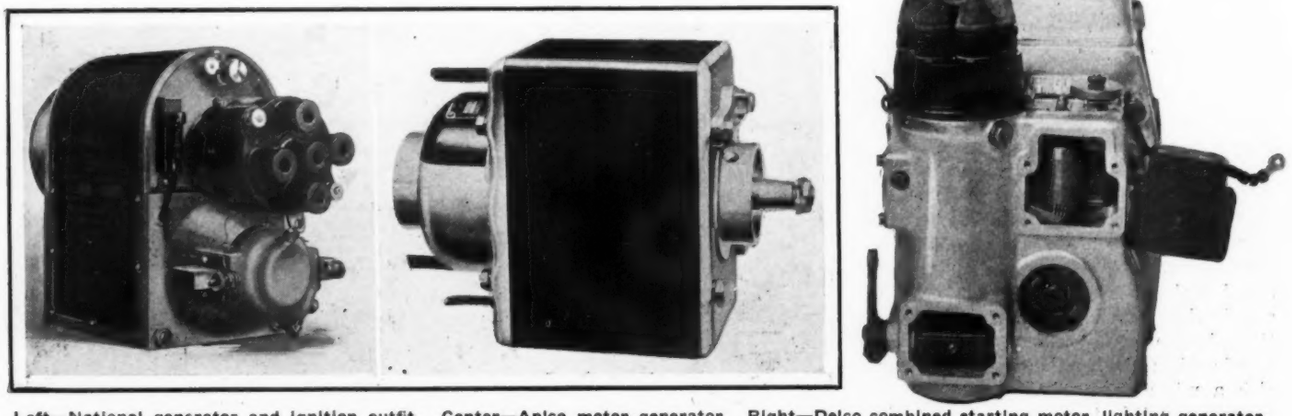
Auto-Lite a Two-Unit

Auto-Lite cranking and lighting systems, which are of the two-unit type, admit of much variation in the methods of application and may be accommodated to almost any amount of space. In order to make this possible, the motor unit is made in two sizes, one longer and of less width than the other. There are two sizes of generators, so that it should be possible to get one of dimensions to fit in the space available.

The Auto-Lite system operates on 6 volts, and besides the two main units consists essentially of a circuit breaker, foot switch, lighting switch, ammeter and storage battery. The Auto-Lite company also makes a form of its apparatus in which an ignition distributer is a part of the generator, the system then caring for all electrical functions.

Auto-Lite Completely Enclosed

The model M cranking motor is a series-wound type of high torque, it is said. It is compact, the length being 8 3-4 inches, width 5 1-2 inches, and the weight 36 1-2 pounds. The entire machine is compactly inclosed in cast iron, which protects all parts from dust and water. By removal of the nameplate band the brushes and commutator are readily accessible. This motor will crank



Left—National generator and ignition outfit. Center—Apico motor-generator. Right—Delco combined starting motor, lighting generator and timer distributor for ignition. The voltage regulator is shown in the upper opening

a six-cylinder engine having 60 pounds per square inch compression pressure at 100 revolutions per minute, using under 95 amperes, it is stated. It is so constructed that it can be applied to the car in either a vertical or horizontal position, and can be connected either to the crankshaft through a train of gears or a chain, or to the flywheel direct by having its pinion mesh with the teeth of the periphery. It can also have a transmission application.

Though designed for exactly the same work as Model M, the other Auto-Lite motor, Model MC, differs in construction and shape. It is 7 1-2 inches long by 6 3-4 inches wide, and weighs 30 pounds. A cast-iron frame and field are used, and the series winding is also present. Removal of the nameplates on the end gives access to the four brushes. This motor can also be adapted to any desired position. It is said to be capable of driving a 4 1-8 by 5, four-cylinder engine of 60 pounds per square inch compression pressure at 185 revolutions per minute. The usual gear reduction is about 25 to 1. In the Auto-Lite application, an over-running clutch is interposed in the drive which disconnects the electric motor when the gasoline motor starts under its own power.

The three Auto-Lite generators are designated as Model G, Type SR4; Model G, Type VR4; Model GC, and Model GB. The first two are identical except that VR4 has the ignition distributer as a part of it. Model GC is adaptable to the same work as the SR4, but is of a different shape. Model GB has been brought out to meet the needs of the small types of cars.

Reversed Winding Regulation

Type SR4 generator is of the excited field type, in which the current output is regulated by reversed windings on the field, which serves to cut down the current produced by weakening the field. The generator begins to charge at an engine speed of 200 revolutions per minute, which corresponds to a car speed of about 5 miles an hour. The output increases until at about 17 1-2 miles an hour the production is 12 amperes. At this point the reversed series winding holds the output no matter how much faster the car travels. The generator operates at engine speed and can be driven in any convenient manner. It can be placed on a bracket just ahead of the magneto and connected directly to the magneto shaft by a simple coupling, the company points out. It weighs 37 1-2 pounds and measures 10 by 4 3-8 inches over all.

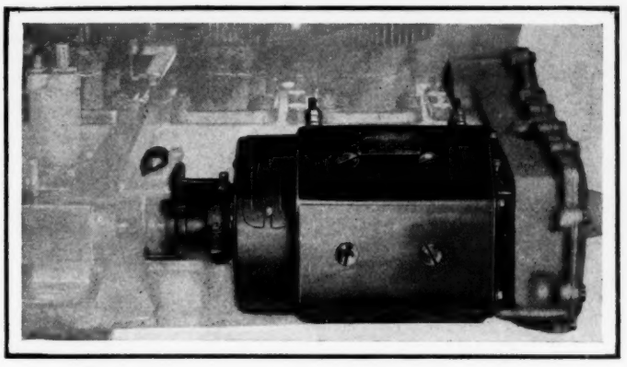
The Model GC generator is designed to be driven by either a chain, train of gears or a V-belt. It runs at 2 1-2 times engine speed, has a maximum output of 14 amperes, and begins to charge at under 7 miles an hour, while 10 amperes is the output at about 12 miles an hour. The current control is the same as that of the generator described above; that is, by a reversed series coil. The machine's compactness may be realized from its dimensions. The length is 8 inches, width 4 inches, and height 6 1-4 inches.

With the aim of keeping weight and size to the minimum, the small car generator has been developed with a 6 1-8-inch length and 4 1-4-inch width, and its weight is 13 pounds. It produces 6 amperes at its maximum, and is driven by a silent chain from either the pump, magneto or crankshaft at 2 1-2 times engine speed. It operates efficiently with a 40-ampere-hour storage battery.

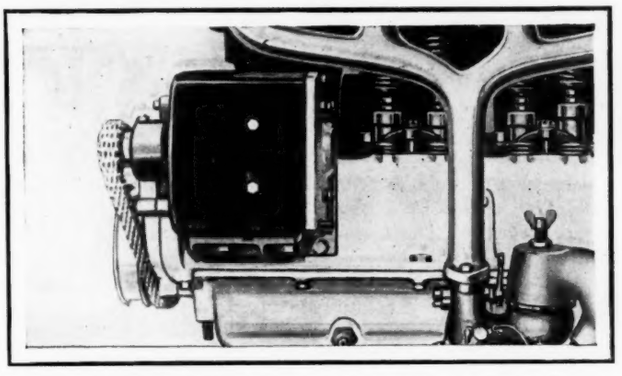
Many Aplco Features

The Aplco line, manufactured by the Apple Electrical Co., formerly of Dayton, O., but now in Newark, N. J., is replete with new features. There is an entirely new motor-generator built in three sizes, one of these being used in a Ford installation and in addition there is a separate starting motor and two separate generators. Apple products are marketed by the Splitdorf Electrical Co.

The new models bear no resemblance to previous designs of either the Splitdorf or Apple companies before their consolidation a few months ago. The new machines are rectangular and have very smooth and neat exteriors. Simplicity has been kept foremost in the design, an example being that the armature is driven from the crankshaft by silent chain. No gears or clutches are used and the armature is the only revolving part in the system. The total reduction is provided by the chain.



Dyneto motor-generator installed on Franklin



Auto-Lite starting motor as used on the Overland

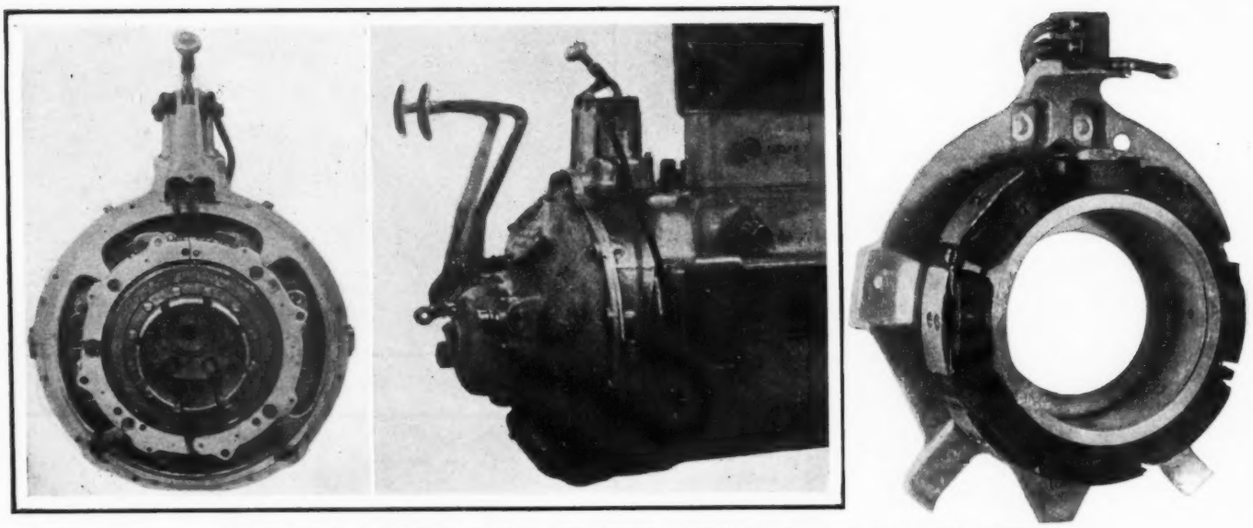
New Models Lighter

In the new equipment lighter weight and smaller dimensions are present. One motor-generator model now weighs 49 pounds instead of 75, and yet it cranks the engine at a much higher speed than formerly, due to the refinements made.

The motor-generator operates at 12 volts as a starter and 6 volts as a generator. It is a compound-wound machine in which the series and shunt fields add their magnetic strength when the machine is operating as a motor, thus giving a maximum starting torque; but when the machine is running as a generator, the current flow through the series field is naturally in the reverse direction, and therefore the series field flux opposes that of the shunt field and the net flux is the difference of the two. By this arrangement, as the speed of the motor-generator increases the voltage remains practically constant above an armature speed of 1,450 revolutions per minute.

By connecting the motor-generator across the terminals of the battery through the starting switch it acts as a motor and spins the engine until it starts, the cranking speed varying from 150 to 250 revolutions per minute. As soon as the engine accelerates to normal speed the voltage is sufficient to charge the storage battery.

An automatic indicating switch makes connection between the generator and the battery when the former is driven at sufficient speed to charge the latter; and likewise when the speed drops the connection is broken, so that there can be no discharge of current from the battery back into the generator. The indicator is equipped with an indicating dial which shows the lettering, Charge On, and Charge Off.



Left—U. S. L. Installation used on new Mercer. Right—Fields of U. S. L. motor-generator

The Ford motor-generator is mounted to the left of the motor and driven by a silent chain with a 3 to 1 ratio with the crankshaft. The instrument is supported on a bracket, which bolts to the flange on the crankcase and also to a shoulder at the base of the front cylinder. Since the driving sprocket takes the place of the fan pulley, other provision must be made for fan drive and this is accomplished through a pulley on the armature shaft.

One of the generators is designed for small machines and will furnish 5 amperes at 6 volts. The normal driving speed is 1,600 revolutions per minute and drive generally by a chain.

Another generator, the S.R.-2, is designed to run at twice engine speed and will give a 7-volt, 10-ampere current. This unit is also made with a special head containing timer and distributor. A feature of this combination is that the generator may be removed for repairs without influencing the operation of the ignition system which may still be supplied by the battery.

These machines have third-brush regulation to keep the voltage constant.

The starting motor is designed for small and medium-sized motors and drives through the flywheel. It is a square shape and is for 12-volt circuits. Its feature is the automatic releasing gear. The instant the motor starts, the contact is broken and the gear releases, even though the starting pedal is held down. This is accomplished by means of a spiral cut in the armature shaft which engages a complementary spiral in the armature bore. The moment the gasoline engine tries to drive the starting motor, which is what happens as soon as it starts, the thrust on the armature shaft throws the driving pinion out of mesh and with this motion the switch contact is broken. This motor is capable of cranking a 3 3-4 by 5 engine at 130 to 150 revolutions per minute. The normal starting current is 70 amperes although the initial kick with a stiff motor may be as high as 160.

Two Motor-Generators—Dyneto

Two motor-generators will be made by the Dyneto Electric Co., Syracuse, N. Y., for 1915. The model A is a new one designed for small-bore motors and the B is continued from last year. No radical change has been made in the new instruments although some refinements have been made. The generator has been improved so that it begins to charge the battery at a somewhat lower speed.

Twelve volts is standard although other voltages can be supplied. Either single or double wiring may be used. Silent chain drive is to be preferred although gear drive may also be used. The gear ratio is between 2.5 and 3 to 1.

The model A motor-generator has a static torque of 25 pounds at 1 foot radius, weighs 35 pounds and generates its rated output at 1,000 revolutions per minute. The model B gives a static torque of 36 pounds, weighs 45 pounds and also produces its rated output at 1,000 revolutions per minute

A cranking speed of 125 revolutions or more depending on the size of the engine is obtainable, the current draw varying under the conditions. With a stiff, cold motor the draw might run as high as 225 amperes for an instant.

A compound winding is used so that when the machine operates as a generator the net strength of the field is the difference of the series and shunt fields, and when running as a motor the strength of the two fields is added.

Jesco Has Several Models

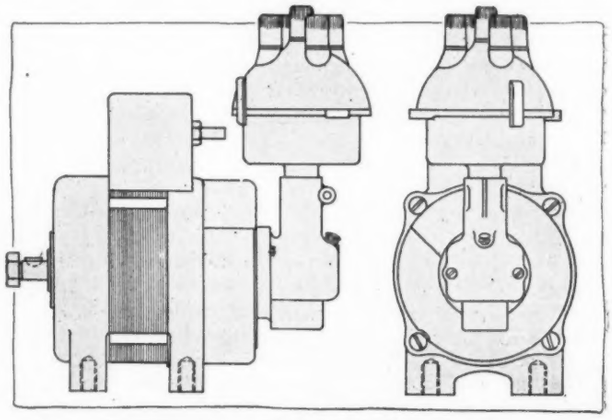
Several motor-generators are made by the Jones Electric Starter Co., Chicago, Ill The 6-volt system is the one commonly supplied but 8, 12,- and 16-volt types are also made.

When starting, the unit operates as a series motor and when furnishing current for lights and storage battery, as a shunt generator. Current regulation is by a vibrator which cuts resistance in and out of the field circuit. This vibrator, together with the starting switch and cutout are mounted in a case on the top of the unit.

On one model provision has been made for the attachment of an Atwater Kent Unisparker, mounted vertically.

U. S. L. Improves Unit

One model of motor-generator of the well-known flywheel type is manufactured by the United States Light & Heating



Jesco motor-generator combined with Atwater Kent Ignition

Co., Niagara Falls, N. Y. The design, however, is modified to suit each installation as regards flywheel weight and torque.

Improvements have been made in armature, fields and commutator. Instead of a steel V-ring construction in the commutator, a steel reinforced moulded insulation is used, the advantages being lighter weight and greater strength. A new light and strong alloy has been adopted in the armature spider. The starting switch is now cast integrally with the crankcase.

Weight has been reduced 25 per cent. and the space occupied by the entire system about 30 per cent. The 12-volt system is standard and double wiring is recommended for starting and either double or single for lighting.

A feature of the new machine is the reduction of the maximum current output at high speeds by developing a high charging current at low engine speeds. Regulation, which is inherent, has been improved so as to secure a drooping characteristic, that is, the highest charging rate occurs at about 500 r.p.m. and then it gradually drops off. This maintains the battery fully charged under all conditions.

Considerable increase has been made in the efficiency of the machine both as a generator and as a motor.

The average speed of cranking is between 150 and 200 r.p.m. For example, a certain 3.125 by 5.5 motor is spun at 220 and a certain 4.25 by 6 motor at 190 r.p.m. The first motor requires a current of 100 amperes and the second 170.

Remy Line Complete

It is the policy of the Remy Electric Co., Anderson, Ind., to manufacture starting, lighting and ignition apparatus to meet the requirements of each particular make of engine yet it has a variety of standard models, including 6-volt starting motor, and lighting generators separately mounted. Two-armature starting and lighting machines with one armature above the other, 12-volt motor-generators and both 6 and 12-volt generators with ignition equipment integral.

The most important development in the starting line is the introduction of a motor for eight-cylinder engines. Some of the motors are arranged for connecting direct to the car maker's reduction gear, others are designed to become an integral part of the reduction transmissions, others complete with reduction gearing and others with the Remy inertia pinion, which automatically engages and disengages with the flywheel type of drive. These standard starting motors are all wound for 6 volts and the variety is such that there is a motor for every size of engine.

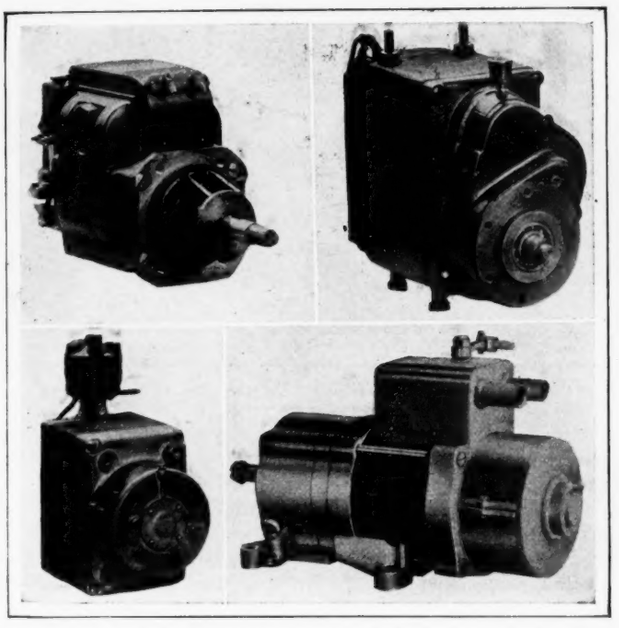
Four sizes of the two-armature motor-generators are made, these instruments combining a generator and motor in one unit, one armature being arranged above the other. The reduction gearing and over-running clutch are built into the housing and operate in a bath of oil. The 6-volt winding is standard and there is but one driving connection with the engine. The armature rotates only when the starting switch is closed and at this time drives the generator shaft through the medium of an over-running clutch of the roller type.

The single-armature motor-generators are wound for 12-volts and are built in either cylindrical or rectangular shapes and in a number of sizes. Any of these may be had with battery ignition, forming starting, lighting and ignition in one unit.

Several models of separate generators are built. Some have drop-forged pole pieces rectangular in shape and others are cylindrical. Some of these instruments are built to fit the standard magneto base and drive coupling.

Combined starting and ignition generators may be had with the ignition parts mounted in unit with the generator or separately. Two different types of battery ignition are used. One with the conventional form of magneto breaker and distributer and the vertical, with one above the other.

In addition the company is making a system of ignition which may be used in conjunction with an electric lighting system comprising generator and storage battery. In one type there is a distributer and transformer coil mounted on a base of magneto dimensions, allowing it to be mounted on the base formerly utilized by the magneto. In another type of instrument the shaft is vertical and both distributer and breaker are driven at camshaft speed.



Upper, left—Remy generator. Lower, left—Remy generator with vertical timer-distributer. Upper, right—Double armature starting motor and lighting generator. Lower, right—Jesco motor-generator

Ten Leece-Neville Models

Ten different models of starting motors, six models of motor-generators and three models of generators are made by the Leece-Neville Co., Cleveland, O., for 1915. Units are built for 6 and 12 volts and for double wiring.

Changes and improvements include the adoption of the cylindrical form for all machines. A feature of the new generators is the charging ouptput curve. Maximum output is obtained at 15 amperes and 7.5 volts on a certain 6-volt generator, and at a very low car speed. After maximum capacity is reached the output drops until at the highest speeds it is only about 10 amperes, which is not enough to harm the battery, it is said. In other words, a high charging rate is available when it is needed most, that is, when a lot of slow, city driving is done with many starts and stops, and when operation is continuous and at a high rate of speed, as might be the case on a good country road, the output is cut.

Another distinctive feature of the system is the circuit breaker combined with the switch on the dash. This has an indicating target which registers the word Charge when the battery is connected to the generator. By certain improvements it is claimed that the battery is now connected to the geenrator at a car speed of about 5 miles per hour.

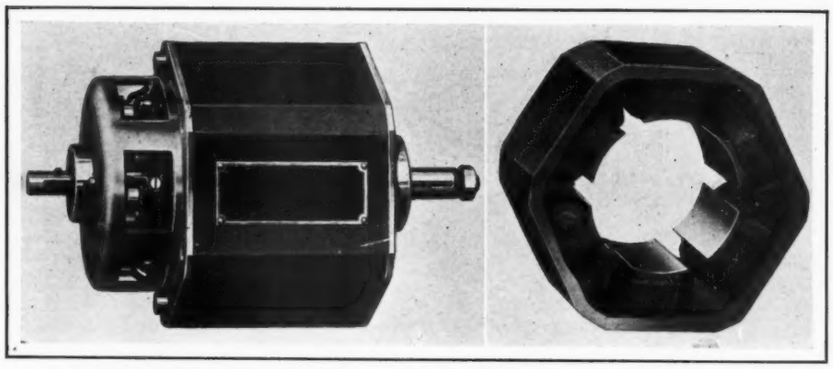
Current control is by the third-brush system.

To give an idea as to the weights, the 5-inch generator weighs 22.5 pounds, and with ignition distributer, 24 pounds.

Starting motors are equipped with all styles of drive and are capable of cranking engines at speeds of 150 r.p.m. on the average. These include clash gear meshing with the flywheel; magnetically shifted flywheel drive; Bendix drive, chain and train of gears.

Kemco Line Complete

The Kemco line has been enlarged so that it now includes starting motors, and generators of different types as well as



Simms-Huff motor-generator. Starter drive is positive and generator drive by belt

the original fan generator which is associated with the Kemco name and built by the Kemco Electric Mfg. Co., Cleveland, O. The 6-volt system is used throughout.

The complete line consists of four starting motors of graded sizes for different-powered motors. These are especially for manufacturers and may be procured with the Bendix drive, silent chain drive or gear drive with overrunning clutch.

There is a universal starting motor which is designed especially for cars already in use. It is mounted in front of the radiator, taking the place of the starting crank. The reduction gears are contained in the starter casing.

Four different models of starting motors are offered. The Pound for Pound is 9 inches long and 5 inches in diameter. Its stalling torque is 35 pounds and its weight is also 35 pounds, hence the name. The Trojan is the same diameter but only 7.5 inches in length. It has a stalling torque of 21 foot pounds and a weight of 23 pounds. The Master Cranker is 5 inches in diameter by 6.5 inches long, has a stalling torque of 12 foot pounds and a weight of 17 pounds. The Little Six cranker is 4.5 inches in diameter, 5.5 inches long, weighs 13 pounds and has a stalling torque of 7 foot pounds.

Dynamo in Two Sizes

Kemco horizontal dynamos are made in two sizes, the smaller 4.5 inches in diameter, 5.5 inches long and weighing 12.5 pounds; and the larger 5 inches in diameter, 6.5 inches long and weighing 16 pounds. The former gives 10 amperes and the latter 15. Voltage regulation is by means of a Ward Leonard regulator and cutout.

The fan generator is made in two sizes, the Kemco standard being 5.75 inches in diameter and 2.5 or 3 inches wide, as desired. Weight without fan sprocket or pulley varies from 10 to 13 pounds according to width. The diameter of the fan is optional. The shaft is fitted with sprocket and friction clutch for chain drive, or V pulley for belt drive.

The Kemco Junior is for smaller cars and measures 4.44 inches in diameter by 2.69 wide. It weighs 6.6 pounds. Drive may be by V pulley or chain.

Ford System Offered

A smaller edition of the universal system is made especially for Ford cars and is used in connection with a fan generator to make a complete starting and lighting system. A Willard storage battery is part of the equipment. The starting switch is a foot-button type.

In addition to these units, lamps, wiring and complete fittings are supplied with this system, price $110. There is an automatic cutout. The electric headlights are fitted with two sets of bulbs, one for country and one for city driving.

Simms-Huff Motor-Generator

The Simms-Huff motor-generator has been added to the line of the Simms Magneto Co., East Orange, N. J. The feature of the device is the use of a belt drive when the machine is operating as a generator, the slippage of the belt being used to adjust the output to the desired amount at any given speed. Voltage regulation is inherent and is obtained by opposing the series and shunt fields. Starter drive is optional. It may be through the flywheel or by chain to the crankshaft or through the timing gears. In any case an over-running clutch must be used. As a starting motor the device operates at 12 volts and as a generator at 6 volts. By the use of a 12-volt starting current the lock torque is stated to be 24 pounds although the instrument weighs but 30 pounds.

The features of the instrument include light weight, hexagonal shape to facilitate mounting, an unusual method of disposing of the armature windings and a unique type of brush holder which eliminates all but one wire. The unit is exceptionally compact yet accessibility has in no wise been sacrificed. All the mechanism that requires inspection, brushes, brush holders and commutator, may be exposed by the removal of a single metal casing which slips over the end.

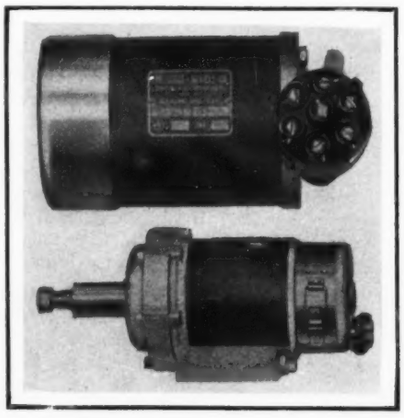
In starting, all the cells in the battery are in series to give the required 12 volts, but when the engine is running the unit automatically becomes a generator and delivers 10 to 15 amperes to the battery at 6 volts pressure; in the latter case the two halves of the battery are in parallel.

Series and Shunt Fields

A charging rate of from 8 to 15 amperes at from 12 to 18 miles per hour may be obtained by simply varying the belt tension and allowing the armature to slip. If the ammeter registers less than 8 amperes at 12 miles per hour, for instance, it indicates that the belt should be tightened, a means for this process being provided in a slotted segment and set bolt on the fan support.

The starting switch is arranged to automatically make the necessary series connections at the battery for the starter and parallel connection for lighting. In addition there are two terminals which may be used for a battery circuit in the event of dual ignition being used.

The cutout, which may be mounted on the dash, is of the usual reverse current relay type. It automatically connects the generator and battery when the charging current builds up to the proper strength. The brush holding mechanism is unusual in that all the wires with the exception of one have been eliminated by connecting each set of three brushes to a metallic ring, one of which is a permanent ground and the other, which is a single wire connection, going to the field winding. Thus six wires are done away with.



Two Leece-Neville units. Upper—Generator with ignition unit. Lower—Starting motor

Holes for Slots

The winding of the armature is another feature that is different from usual prac-

tice. Though it is of the drum wound type, the winding is passed through circular holes punched in the core laminations. The result is that the wires are thoroughly protected and cannot be thrown out by centrifugal force should the starting gear stick and cause the armature to rotate at excessive speed and additional surface is exposed to the action of the field.

Nash Generator and Ignitor

One starting motor and a combined ignition and lighting unit are manufactured by the Chicago Telephone Supply Co., Elkhart, Ind. The starter, which is known as the Briggs, is intended for all sizes of gasoline engines, a lower gear ratio being used with large motors. The machine is 5.5 inches in diameter and 9.5 inches long. It weighs 30 pounds.

The generator, also a 6-volt design, has the ignitor mounted on a vertical shaft at one end. A feature of the machine is that maximum current output is reached at a very low speed. Ordinarily the Nash generator gives 15 amperes maximum and this at a speed under 15 miles per hour. The current regulator is mounted directly on the top of the machine and consists of three relays. One cuts in when the generator develops 6 volts. The second and third relays are designed to cut resistance in series with the field coils, thus reducing the current output and flattening the curve. The latter two have positive adjustment and may be set to flatten the curve at any point.

The generator measures 11 by 5.375 by 5 inches.

North East Makes One Model

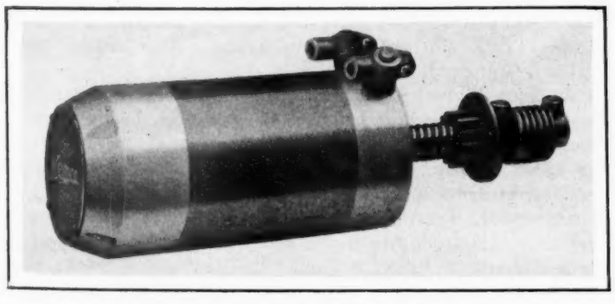
A single machine for starting, lighting and charging the storage battery, made in but one model, is built by the North East Electric Co., Rochester, N. Y. There are, however, several different methods of application, so that it may easily be attached to any car. The latest method is termed the universal application which was described in THE AUTOMOBILE for October 15. For larger cars the system operates on 24 volts and on smaller ones 12 volts is standard.

No reduction in the size of the machine has been made but its efficiency has been increased, the torque is larger and an improved regulating device has ben designed. In nearly all applications the gearbox type of drive has been eliminated, the drive generally being direct from the crankshaft by means of a silent chain.

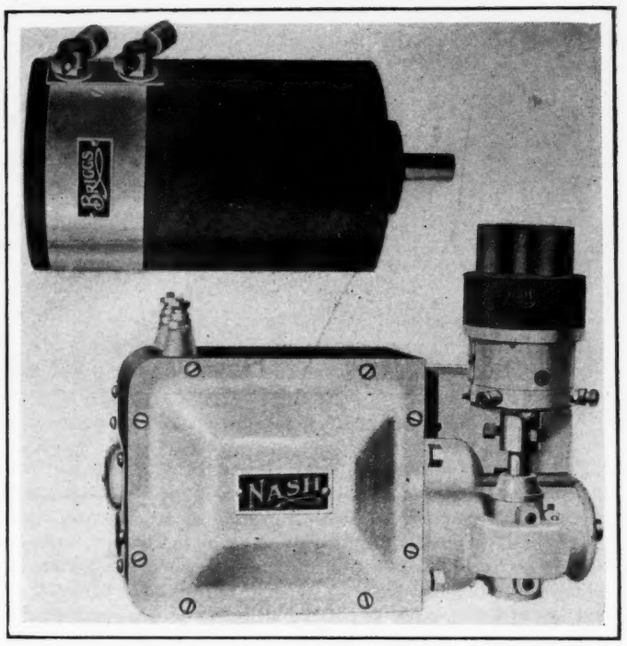
The cranking speed varies from 150 to 200 r.p.m., depending on the size of the engine while the ampere draw when running varies from 50 to 60 for an ordinary 4 by 4.5-inch four-cylinder motor, although at the instant the starter switch is closed the flow may reach 125 amperes.

The charging rate is approximately 7 amperes at 12 volts. The charging circuit is automatically closed at about 9 miles per hour. Voltage regulation is obtained by means of double field windings with a limiting relay which regulates the field resistance.

Special fittings are made so that this system can be applied to the Ford car. The motor-generator is placed at the left of the motor and the storage battery placed under the rear floor boards. The motor-generator is mounted on a bracket which bolts to the lower cylinder flange and the armature is connected to the crankshaft by a double silent chain, there being an intermediate pair of sprockets through which the fan is driven.



Kemco starting motor with Bendix drive



Upper—Briggs starting motor. Lower—Nash generator with ignition unit combined with it

Universal System for Old Cars

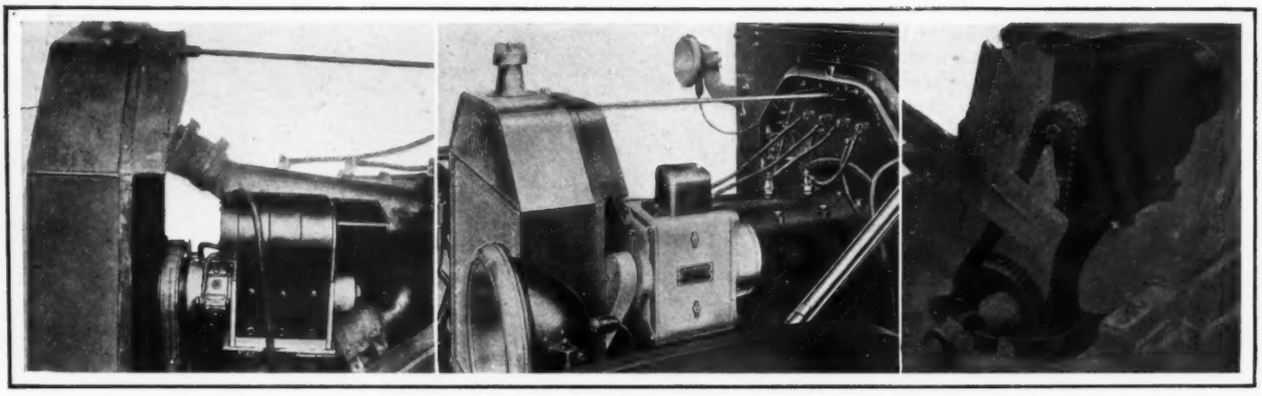
The universal system is designed especially for old cars and may be attached with very little fitting. The motor-generator is mounted between the front frame members by means of two cross bars. The rear bar is an angle iron which is bolted at each end to the webs of the channel frame section by means of small angles. In the front the unit is supported by a heavy tube which clamps to the horns of the springs.

The motor-generator is placed above the plane of the crankshaft and as the driving chain is at the front, the shaft which runs to the crankshaft passes under the unit. This shaft has long flutes milled in it and it may be cut to any length desired. The coupling which makes connection between this shaft and the front of the crankshaft is left blank and is machined to suit each particular installation.

Disco—A Motor Generator

The Disco Electric Starter Co., Detroit, which went under a re-organization last year, and has for its present stockholders a number of well-known business men, and which has acquired for its chief electrical engineer Prof. B. F. Bailey, well-known in his field, has come to the front with a new design of starting and lighting system of 12-volt type with a combined motor-generator as the main unit. The outfit in addition to this includes a storage battery, combined cut-out and regulator, lighting switch with dimmer attachment, starting switch and other lesser accessories.

The motor-generator is adaptable to any make of car. It is connected to the crankshaft by a silent chain. For starting, the motor is connected directly with the battery by means of the foot switch. As soon as the engine picks up, the unit starts to charge the battery. The connection to the battery is not made until the generated voltage is high enough, the cut-out automatically taking care of this. Combined with the cut-out in a unit on top of the motor-generator is a vol-



Left—Esterline Ford lighting generator. Center—Gray & Davis single-unit Ford system. Right—Disco Ford motor-generator

tage regulator which prevents the generated voltage from attaining too great an amount when the speed of the car is high. The regulator consists essentially of an electro-magnet which pulls down an armature and opens a contact, thus inserting resistance in the shunt field of the motor-generator which serves to cut down its generating ability.

The Disco Company is now making this motor-generator in three sizes, all of which act upon the same principles as outlined above. The smallest size for engines up to 3 1-8 inches bore measures 9 1-4 by 6 9-16 by 4 7-8 inches. The next size, which is specially adaptable to the Ford engine, is made for motors up to 4 1-4 inches bore of 60 pounds per square inch compression pressure. It has the same height and width as the smaller size, but is 11 1-4 inches long. The largest size is 14 inches in length, but has the same width and height as the others. All have the same method of attachment by silent chain, and the reduction is 3 to 1. They are all capable of turning engines over at from 180 to 200 r.p.m.

The illustration shows the method of attachment of the Ford size to a Ford motor. This motor-generator weighs 42 pounds, and with complete outfit is sold at $99 ready to install. A large forked-shaped bracket is supplied, which bolts underneath the engine and has attached to it another bracket which carries the electric unit.

The Disco systems operate with the single-wire method of connection, the return circuit being provided by grounding.

Allis-Chalmers Adds

A larger size motor-generator is the one addition to the Allis-Chalmers line. This company, located in Norwood, O., is continuing the motor-generator for smaller cars, and in addition makes separate starting motors and generators, each of which is manufactured in one model and in two sizes. Six volts are standard and either the single or double-wiring systems may be used.

Improvements consist in the refinement of details, and the only change of importance is the more liberal design of the magnetic circuit of the starting machines so that greater torque is secured.

In all models the special radial brush holders are retained and the armatures are banded together with steel wire, not only on the core, but also on the front and rear connections. These bands are anchored against any tendency to slip and after the armature has been impregnated in Bakelite it is capable of withstanding high overspeeds.

As a generator, the unit is designed to cut in well below a car speed of 10 miles per hour and to obtain full charging current as soon as possible.

No reduction has been made in the size of the smaller motor-generator, which is 5.63 inches in diameter, 10 inches long and weighs 35 pounds. The larger motor-generator, which is the new one, is 6 inches in diameter, 10.25 inches long and weighs 48 pounds.

As used on a certain car, the motor-generator is driven by a silent chain from a sprocket on the crankshaft just behind the flywheel, the ratio being 3 to 1. On another car using a motor with cylinders 2.75 by 4 inches, the motor-generator is driven through gears at a ratio of 3 to 1, the gear on the flywheel driving the sprocket on the motor-generator shaft.

On the smaller size of motor-generator the stalled current, that is the current drawn on closing the switch and before the gasoline engine moves, is approximately 300 amperes, and when cranking, the current varies from 60 to 100 amperes. The larger size motor-generator takes 500 amperes stalled current and a cranking current of 80 to 130 amperes. The drop in current from the static condition to cranking is very rapid so that very little more power is taken from the battery. A cranking speed of about 100 revolutions per minute is possible.

The separate starting motors and generators measure 4.5 by 9.5 inches and weigh about 22 pounds. The motor has a long shaft extension to accommodate the Bendix screw gear. On one newly designed motor the application has been made directly to the flywheel at a ratio of approximately 11 to 1 and the engine is cranked at a speed of 175 revolutions per minute. The generator on this installation is driven at 2.5 times engine speed.

Current regulation is by a vibrating reed regulator.

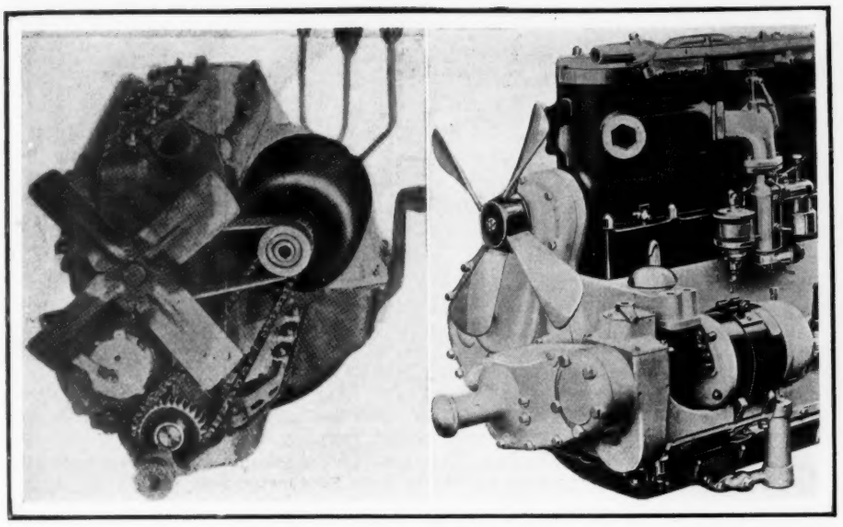
Ward Leonard Expands

A larger and smaller starting motor, a dynamo for small cars, and an engine-speed generator for four-cylinder cars have been added to the output of the Ward Leonard Electric Co., Bronxville, N. Y. The motor-generator is furnished for small cars when desired.

The two new starting motors are practically identical with the two types of last year except as to size. All motors are series wound and are designed to crank the engine at a speed of about 125 r.p.m. with an average current consumption of 125 amperes, 6 volts. This voltage is standard although 12 volts may be had. Likewise the double-wire system is recommended although the single may be used.

Only one change has been made in the new motors and that is to give slightly increased starting torque; in all other respects the machines are unaltered. The Bendix spiral drive is standard.

A small, high-speed generator for small cars with a lamp load of corresponding proportions has been brought out to meet the demand for a unit of this size. It may be driven by chain or belt. In addition a generator for four-cylinder motors, in asmuch as it is designed to be driven at magneto shaft speed, has been added. This generator supplies 10 amperes at 400 r.p.m. Up to the present, one generator has been used both for four- and six-cylinder motors, it being direct-connected to the magneto shaft on the sizes and geared up on the fours; but with the coming of the new model, the



Left—Ford motor-generator made by the General Electric Co., and known as the Genemotor. Right—North East motor-generator

1914 generator will be continued as one for six-cylinder machines exclusively and the new one will be for fours exclusively.

The generators are shunt wound, current regulation being by means of an automatic controller of the vibrating type. The company states that no change has been made in this device since it was brought out 5 years ago.

By means of this device the dynamo will not charge the battery at a greater rate than 10 amperes regardless of the motor speed. This device also acts as a cutout, breaking the circuit when the speed of the generator falls too low to generate voltage equal to that of the battery.

The motor-generator is compact for the reason that large wire of low resistance is used in the series field with the result that a strong field and high starting torque are obtained. The standard type of controller is used with this machine, thus the current is kept at a constant value as in the separate machines. This controller is short-circuited during the starting period and is automatically inserted when the engine is started. Constant current is supplied from the time the dynamo cuts in on the battery until maximum speed is reached.

The Ward Leonard company is prepared to furnish starting and lighting specialties to manufacturers of this equipment. These parts include enamelled resistance units for controllers, resistances for headlight dimming, cables, switches and combined controller and cutout. The company makes a specialty of furnishing current controllers to other makers of starting and lighting equipment and only offers its complete system to car manufacturers.

Both starting motors and lighting generators are built with either round or square housing to suit the individual manufacturer.

Many Ford Systems

In addition to the Aplco, Kemco, Gray & Davis which have already been described, there are several companies making Ford systems and nothing else in this line. Descriptions of these are given below.

Wells—Single-Unit Ford

A starting and lighting system for Fords is made by the R. C. Wells Mfg. Co., Fond du Lac, Wis. It is a single-unit motor-generator type, the machine being mounted at the right of the engine in the customary place and driving through the crankshaft by a silent chain. As a generator the machine runs at engine speed but as a motor the gear reduction between it and the engine is 4 to 1. The outfit includes current indicator, switches, storage battery and wiring harness and the price complete is $115.

General Electric Genemotor

The General Electric Co., Schenectady, N. Y., large makers of electric motors and generators of all sizes is manufacturing a 12-volt motor generator known as the Genemotor, and designed especially for Ford cars. It sells complete without lamps for $80. A. J. Pickard & Co., 1720 Broadway, New York City is the sole distributor.

The Genemotor is mounted on the left of the motor on a suitable bracket. The drive is by silent chain direct from a sprocket on the crankshaft. This sprocket takes the place of the fan pulley and the fan is driven by a new pulley attached to the armature.

The Genemotor is a fully-enclosed machine, cylindrical in shape, about 7 inches in diameter and 10 inches in length. It is firmly secured to the body of the engine by a special bracket which can be attached without fitting. There is no drilling or tapping of holes. When mounted, it is supported rigidly and is fully covered by the engine hood.

The regulation of the charging current for the battery is accomplished without the use of external regulators. The windings of the Genemotor itself are so arranged as to give the necessary regulation.

The motor starting switch is mounted directly at the top of the machine and is actuated by a pushrod passing through the dash-board of the car, and having its handle located within convenient reach of the driver. This switch is enclosed, but accessible.

When operating as a generator, it begins to supply current when the car is running at about 9 miles per hour and its windings are so arranged that over-charging is prevented.

The main switch is closed through a cam actuated by a pushrod. The contacts are of the multi-leaf pattern and the switch is provided with a mechanism which assures a quick-break on opening.

Jackson Ford Lighting System

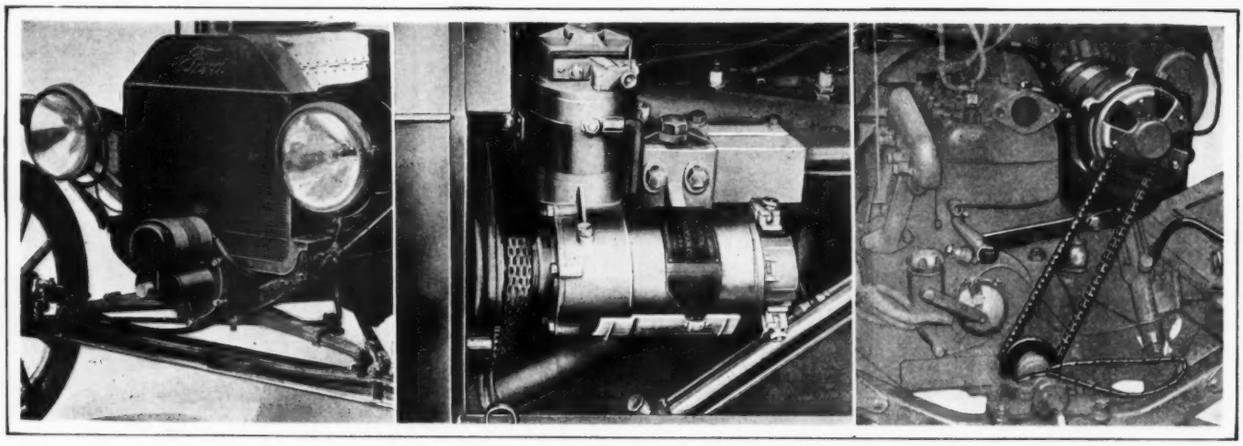
A 6-volt lighting system is manufactured by the Charles A. Jackson Co., Park Square, Boston, Mass., and it is designed for mounting at the right of the engine on a suitable bracket and is driven from a broad, flat belt which also drives the fan. To accommodate this belt a special pulley replaces the ordinary fan pulley on the crankshaft. A feature of the drive is the use of spurs on the small generator pulley which project into holes in the belt, thus giving the effect of a chain drive. Since the driving pulley is much larger spurs are not required on it.

Voltage regulation is by a centrifugal governor. A cutout is provided to prevent the battery discharging through the generator at low motor speeds.

The normal speed is 1,800, weight 9.5 pounds and the output is 8 amperes at 7 volts. The length is 8 inches and the extreme height 5 inches.

Esterline Makes Ford Dynamo

The Esterline Co., Indianapolis, Ind., has brought out a Ford generator. It has permanent magnets and is driven by a belt which also runs the fan. The feature of the machine is the use of the permanent magnets in connection with an electro-magnetic field, the result being a greatly



Left—Kemco starting motor for Fords. The generator takes the place of the fan. Center—Hartford starting and lighting system for Fords. The motor is the vertical unit and runs up to 10,000 r.p.m. Right—Wells Ford motor-generator

increased output, due to the combined strength of the field.

All the necessary attachments are furnished with the generator. It is stated that the machine can be applied in 3 hours, and that it is not necessary to remove the radiator or other parts of the car to do it.

The regulation of the current is inherent. An automatic cutout is provided for disconnecting the battery when the speed of the generator drops so low that the battery would discharge through the armature windings. The cutout is mounted directly on the generator, thus reducing the wiring to a minimum.

The balance of the equipment comprises the lighting switch, storage battery, lamps and the necessary cables, the latter being marked so that no mistake can be made. Golden Glow glass reflectors are included in the equipment. They are mounted in the regular Ford lamps.

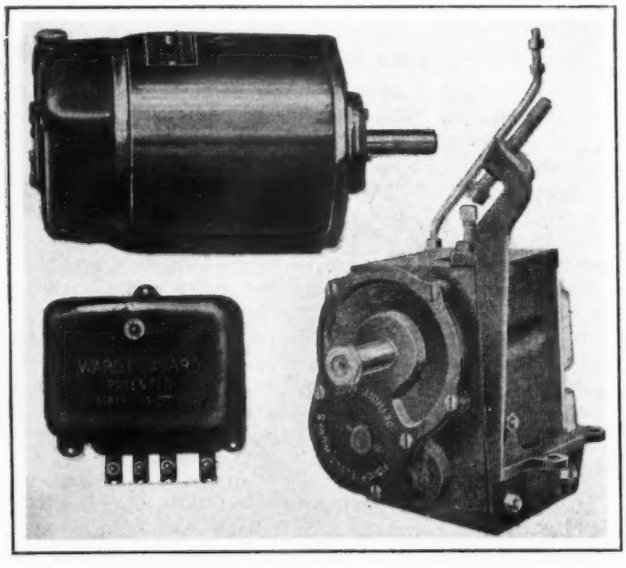
The machine has an output of 10 amperes and weighs 24 pounds.

Hartford Ford System

A high-speed starting and lighting system for Fords is manufactured by the Hartford Suspension Co., Jersey City, N. J. Motor and generator are separate units, the generator being mounted horizontally and the motor vertically, drive being from the front of the generator through a worm gear. The generator runs at approximately twice the speed of the crankshaft with which it is connected by a chain. The motor operates at a speed of from 8,000 to 10,000 r. p. m. The advantage in the high speed is that low weight is secured. The whole system weighs 54 pounds.

The cranking speed is about 300 r. p. m., and the voltage is 12. The price is $100, complete except lamps. A 50 ampere-hour battery is furnished.

The unit is attached to the left of the gasoline motor, and is mounted in a bracket which is bolted to the cylinder casting. Both the generator and the motor can be quickly removed for inspection.



Upper, left—Ward Leonard starting motor. Lower, left—Ward Leonard combined cutout and regulator. Right—Fisher starting and lighting unit for Fords

Fisher Ford Outfits

The Fisher Electrical Works, Detroit, continues to make its electric lighting system which is attachable to any car and sells for $37.50, and has also perfected a cranking and lighting outfit for Ford cars. The main unit of the latter—the motor and generator—is housed integrally, though there is a separate armature and field for both the motor and generator, one being positioned directly above the other.

The Ford outfit is designed for chain drive, and consists of brackets, switches, 12-volt, 35-ampere storage battery and wiring. The price is $120. The outfit is designed for attachment by any owner, and full directions for this work are sent with it. A sprocket is fitted to the front end of the crankshaft just back of the starting crank ratchet. The ratio is 1¼ to 1 between the generator and engine.

The generator is operating whenever the engine is running. Its energy goes to the storage battery to be used for lighting and for driving the electric motor. Gear connection between the armature of the motor and that of the generator is a part of the unit itself, and when the electric motor is operating, its power goes through this gearing and thence through the chain to the crankshaft.

The Fisher lighting system has for its main unit a 24½ pound generator which delivers its full voltage at 300 r. p. m. and at 380 r. p. m. is charging the battery at the rate of 1 ampere. At 950 r. p. m. it is charging at a 6-ampere rate. It has a regulator which is incorporated with it and which prevents the delivering of over 8 amperes at any speed. This regulation is automatic.

The unit is adaptable to any type of drive, such as belt, chain, gearing, or couplings. A simple installation is to attach it so that the fan belt can do double duty. The outside dimensions are: length, 9 3-16 inches; width 5¼ inches; height 6⅞ inches. It is designed to be driven at the same speed as the crankshaft.

Electric Touring Field Enlarged

E. V. A. A. Issues Annual Book on Routes and Charging Stations

NEW YORK CITY, Jan. 23—The ninth edition of the New York Electric Vehicle Assn.'s book of Electric Automobile Charging Stations and Route Maps, has been issued. This book, which is an annual publication, has several new features in the 1915 edition in addition to the map, which was prepared by the Automobile Blue Book Publishing Co. There is a list of all charging stations in this city and within a radius of more than 100 miles, together with the distance of each from Columbus Circle, the maximum amperage and voltage available, the hours during which service can be obtained, the cost per kilowatt, and the price charged for boosting. One of the new features is a map of Manhattan and the Bronx, showing the location of all charging stations, numbering fifty-one.

Routes Extended

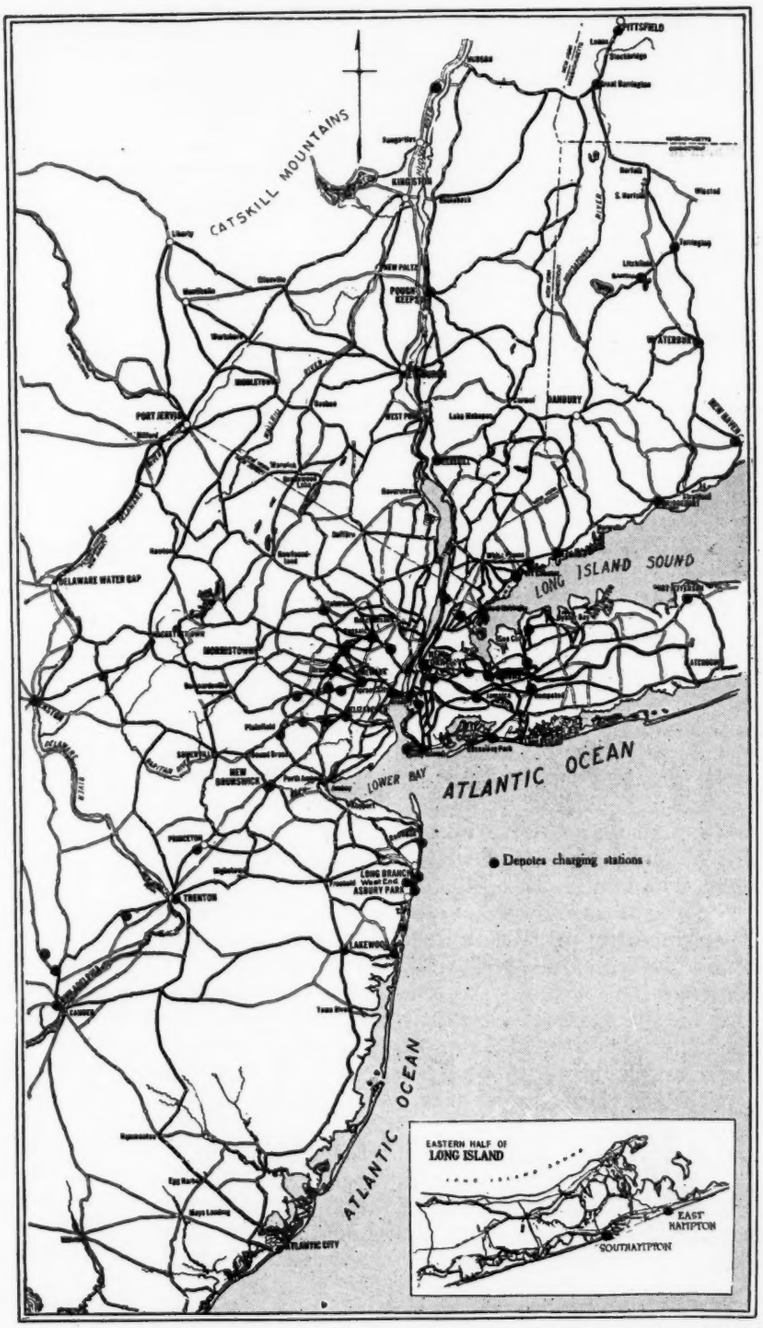
Last year's edition mapped out seven tours for the electric car tourist, giving convenient charging stations and the mileage between them. This year, with the help of the map, the tourist may pick out many more tours, extending to the north as far as Pittsfield, Mass., to the south as far as Atlantic City and Philadelphia, to the west as far as Easton and to the east, extending through all the important towns in Long Island, as far as Port Jefferson.

The added charging stations this year between this city and Philadelphia, and points through New Jersey, should especially attract the electric tourist to that state. Looking over the map, more than ten charging stations are shown between this city and Philadelphia, all of them conveniently placed. Starting out from this city for Philadelphia by way of Newark, Elizabeth, Plainfield, New Brunswick, Princeton, Trenton, and from there to Philadelphia, the tourist will pass through many excellent stretches of roads, and will find no inconvenience in the matter of charging stations, as each of the preceding places has charging stations. From New Brunswick, a run may be made to Easton by way of Somerville and Washington.

Many Charging Stations

All the territory inside of New Brunswick, Morristown and Paterson, is well supplied with charging stations, thus affording the electric tourist many interesting trips through the Orange Mountains and the surrounding country. But the electric car owner is not restricted to this one state in his touring activities; there is Long Island, for instance, whose charging stations are just as well placed as in New Jersey. The run to Port Jefferson, a distance of about 57 1-2 miles, can easily be made by way of Long Island City, Flushing, Mineola and Roslyn. A run along the eastern half of the island may also be made by way of Port Jefferson and across to Southampton.

The association has sent copies to all local electric owners. Offices are at Irving Place and Fifteenth street, city.



Map prepared by The Automobile Blue Book Publishing Co. for the Electric Vehicle Assn.'s book on charging stations and route maps

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The Engineering Foundation

THE Engineering Foundation, inaugurated by the United Engineering Society, is the name given to a fund to be devoted to the advancement of the engineering arts and sciences in all their branches, to the greatest good of the engineering profession and to the benefit of mankind. The initial gift for the foundation is from Ambrose Swasey, past president of the American Society of Mechanical Engineers, who contributes $200,000.

The purposes of the foundation are as broad as the engineering profession itself, the intention being to aid in valuable research and scientific work wherever it is found. The trustees are representatives of the mining, electrical and mechanical engineering societies, and the Society of Automobile Engineers is represented by one of its vice-presidents, F. R. Hutton, who is also secretary of the United Engineering Society.

The movement is in line with the suggestion of developing a broad engineering society which will embrace all the sciences and of which the different specialized societies will be component parts. The unity of the engineering bodies would create a spirit of co-operation which could be of the greatest use in increasing the efficiency of all the component parts through the prevention of overlapping work. At the same time there would be no reason why any would lose their identities or cease to be in the closest relationship with the industries that they represent.

The gift is for the greatest good with no restriction on where it should be placed and the result is twofold. First the stamp of recognition which the United Engineering Society places upon the work in question and secondly the financial aid to carry out the purposes recognized. It is to be earnestly hoped that Mr. Swasey's gift is the commencement of a new era in engineering unity and progress.

The Chicago Show

ONCE more the exhibition of the middle west shows that the automobile public awaits with the greatest interest the coming of this annual event in the yearly cycle of the automobile industry.

While the number of new announcements is generally not so great at the Chicago show as it is at New York, there are still a large number of concerns who await the opening of the later event before exhibiting for the first time the plans they have made for the coming season. This is the year of eights and naturally the announcements of the four additional names at Chicago is regarded with the most widespread interest; but on the other hand there are announcements of new sixes and fours which, while not as spectacular, are also far-reaching in their effects.

Accessories are such an important phase in the automobile industry that the amount of space taken by the exhibits of these small articles takes a large percentage of the total space and certainly a large share of the attention of the visitors at the show. The new devices on display at Chicago constitute an important feature of the exhibition, many of them making their first appearance there.

Industrial Relations

A MOVEMENT which may mean much to the development of better industrial relations and closer co-operation between employer and employee, with a resulting increase of manufacturing efficiency, is given stronger emphasis by the investigation being conducted in New York City by the United States Commission on Industrial Relations. The intense interest displayed in this movement is indicated by the way in which the entire country is closely following the investigation, especially the testimony of prominent manufacturers who, as employers of large numbers of men and women, have made some endeavor to infuse into their relations with these employees the idea of profit-sharing and other forms of co-operation which bring more satisfactory working conditions as well as increase the profits of the employer and the wages of the employee.

While at present it is problematical just what will be the outcome of the investigation now in progress, the latter is of the utmost importance as pointing out that the ever-growing interest in the movement which it represents will ultimately bring far-reaching results.

European Trade After the War

The Possible Market for American Cars—S. A. E. Debates Question of Producing Special Export Models *

NEW YORK CITY, Jan. 27—It would be an utter impossibility exactly to forecast the conditions that will prevail in Europe after the present condition of affairs has terminated, but out of the mists of uncertainty there emerge two definite and unassailable facts. The first is that literally huge numbers of automobiles of all kinds and sizes, both pleasure type and commercial are being consumed by the armies and will have ceased to exist absolutely by the time the war is ended. The second is that all Europe will be greatly impoverished for it will take the work of a generation or more to pay the stupendous bills that are being piled up by each belligerent nation.

Victors and vanquished alike will have to apply the whole energies of their peoples to repairing the damage to their national exchequers.

The Pleasure Car Field

So far, the American trade has not thought it worth their while to manufacture a car or two solely for export, though it has been done in other less progressive countries. The author would like to suggest that the time is now ripe for a real threshing out of this subject and that good might result to both parties; the manufacturers here on the one hand and the buying public in Europe on the other.

It is, of course, a large undertaking to manufacture a car solely for overseas consumption, but it would be worth while if the assured market was sufficiently big, and it is going to be far bigger than ever before. Remember that many of the European automobile factories are dormant so far as car production is concerned; that not a few of them are destroyed, that their workmen are scattered and even their engineering staffs largely absent, and it is sufficiently obvious that the European trade will hardy be ready to tackle a changed outlook immediately upon the cessation of hostilities.

In one respect cars for export have already to be altered, this being that the right hand steering position is needed in England and expected on the Continent, although by rights the now standard left hand arrangement is the correct one for all places with a right hand rule of the road. It is to be questioned whether some of the other alterations to make American cars more acceptable to foreign importers could not be made almost as easily, so that to manufacture for export would not mean manufacturing from A to Z. It was obvious at the New York Show that a really big effort is being made here to increase the power output of the small fours, and conversation that the author has had with one or two manufacturers shows that there is a strong idea that a quite light four or five passenger car has a big future before it in America, if only greater power can be obtained at reasonable manufacturing cost, and without increasing the dimensions or weight of the motor. Take the best practice in six cylinder work as exhibited at the Show, apply the same principles of design to a four cylinder job with say a 3 1-4 by 4 1-2 inch motor and you would have features acceptable to both American and European buyers.

Turning to the matters of smaller detail that are, and are likely to continue, essentially different, perhaps these may be indicated by a short list of reasons that have, to the author's direct knowledge, prevented the sale of American cars to English people who had seriously considered buying.

Of these the black or very dark finish customary on less expensive American automobiles is one of the most important. The average car in England or on the Continent is light colored, buff and pale grey being favorite tints.

Next in importance is the height of the seats and the upright nature of the backs thereof; for while this may be right enough for rough roads of America a much easier reclining arm-chair position is far the pleasantest on the smooth highways of the old world.

Next may be placed the height off the ground, since the European is accustomed to low built cars and naturally thinks that the low build looks correct; as in fact it is for the same reason that the lower seating is right.

Yet another question of bodywork is that the door handles and carriage fittings generally on most of the exported cars are below the European standard of design and finish.

It should be explained that the author has not in mind the cheapest of all imports to Europe, but rather the cars for which the equivalent of about $1,250 is asked, or even more. Europe has no five passenger cars at this price and the man who wants that capacity has no choice between a used European car and a new importation.

Turning to the chassis, a really neat looking motor is an immense advantage and, here too, sales have been lost by reason of rough external finish; for in Europe rough exterior can pretty safely be taken as indicative of rough interior also. Fifty cents worth of sandblasting on aluminum and cast iron and an equal amount spent upon the proper polishing of brass parts is worth dollars of advertising. Another mechanical detail that is not approved is the brakework, especially the contracting band brake on the rear wheels. This is intrinsically unlovely and it is never efficient, as was found out long ago by many users.

Brakes of internal type side by side on the wheels are acceptable and are easy to provide, while they are a feature that the American public will demand too, as soon as they find out their good points. Another thing which appeals to the mechanically minded purchaser, which is a common kind in England, is a rather higher speed capacity. The British driver does not want to do everything on top, but he does not like to find that forty miles an hour is the all-out limit of a nominal twenty horsepower automobile; improvement in the motor will tend to cure this, but meanwhile a little increase in gear ratio would be a pretty good substitute.

The Truck Market

It is possible to have fairly definite ideas about the future state of the pleasure car trade, but the truck business is a very different matter. We all know how the truck trade is at the moment, but it is the veriest guessing to predict what it will be like. We have only one fact to go upon and that is there will be a shortage of horses for industrial work which must encourage many to adopt mechanical methods of handling goods years sooner than they would otherwise have done. There is a general impression in England that the demand will be for the two-tonner first of all, with a possible exception in the vehicle of three tons capacity, but it is the smaller kind from one to two tons that must appeal most strongly to small business houses who will be turned to motors by the high price of horses. It is the profound conviction of the author that there is a gigantic field for a strong van to carry a maximum load of 3,000 pounds rated therefore at one ton, but it is essential that the first cost be low. In the field where such a machine would find buyers low first cost is the deciding factor, because the outlay of several thousand dollars on one vehicle is often impossible to small traders, even though its maintenance may be less than that of the horses he now employs. Cannot America make a thousand dollar one-ton truck along the ordinary lines of design, a real truck and not a bastard pleasure car? If it can be done there is a fortune in it.

*Digest of a paper to be read before the Metropolitan section tomorrow evening by A. Ludlow Clayden.

War Hurts Italian Car Builders—Lancia

NEW YORK CITY, Jan. 26—Vincenzo Lancia, the Italian automobile manufacturer, arrived in this country January 21. A quick trip was made to Baltimore to inspect the new models of American cars then on exhibition. He returned to this city Saturday, where he is making his headquarters with Adams & Montant, the Lancia representatives in this country. He will probably return to Italy January 30.

Mr. Lancia states that the Italian passenger car manufacturer has been greatly affected by the war. A few cars are still being turned out, but most of the work in the plants is on motor trucks, which are in great demand. The earthquake, which occurred after his departure, will further depress industrial conditions. Turin, the center of automobile manufacturing in Italy, was not in the zone of trouble.

"The small American cars are wonderful at the price," he said, in speaking of the impressions he gained on his visit to the show in Baltimore. "We cannot begin to meet them on a price basis. Also there has been a decided improvement in bodies on the American cars of all prices."

Arbitrary Methods Mean Industrial Unrest

Democratization of Industry Is Advocated at Investigation Held by U. S. Commission on Industrial Relations — Necessity for Workmen to Organize Acknowledged by Prominent Manufacturers

NEW YORK CITY, Jan. 23—An investigation of the industrial unrest and the remedies for that and other industrial and economic problems has been held this week at the City Hall by the United States Commission on Industrial Relations. A number of the speakers were prominent manufacturers and philanthropists, among them being G. W. Perkins, director in the United States Steel Corp.; Henry Ford, E. J. Berwind, director in various coal mining companies; Samuel Gompers, president of the American Federation of Labor, and Daniel Guggenheim, president of the American Smelting & Refining Co. and director of the Guaranty Trust Co.

All of the speakers agreed that arbitrary methods result in industrial unrest. Mr. Guggenheim advocated the "democratization of industry," State or Federal social insurance, including health and old-age insurance, and the obligation of the Government to find employment for those who would work, but find no private employment. By democratization he meant, in a word, that the man who performs the labor shall have a voice in the industry. He also said that workmen must organize, even though there are good and bad unions; that the individual worker will get nowhere unless he organizes.

"Industrial unrest is on the increase, I think," proceeded Mr. Guggenheim. "The greatest canker in the world is the canker of envy. I think we are getting away from the old idea that we must ruin competitors to succeed."

Mr. Perkins said he does not believe that competition is any longer the life of trade, but rather the principle of co-operation and organization in industry, including both labor and capital, is the ruling factor. He urged profit-sharing as a worthy supplement to the wage system for compensation of workers; fixed the cause of industrial unrest on the defects and maladjustments of Federal laws and administration, suggesting the formation of a Federal commission on economics, and asserted that under Federal regulation and complete publicity large business units, instead of being a detriment to labor or trade, can be of great benefit to both.

Mr. Gompers declared he would oppose the Perkins proposition to put labor under the same control as capital, his point being that if labor were compelled to incorporate its funds would constantly be at the mercy of legal attempts to confiscate funds which the laboring men had saved. He also said that the two great troubles from which labor has been suffering are the constant influx of immigration and the failure of the workers themselves to organize and have a voice in shaping the conditions under which they worked.

Henry Ford, who preceded Mr. Gompers on the witness stand, stated concerning the effect of centralized control of labor, that any manufacturing institution that is successfully making a single product should increase the business and its plant and make more work to employ more men.

After briefly reviewing his life history, Mr. Ford read into the record the answers to ten questions previously submitted to him by the Commission. In his answers he briefly described his profit-sharing plan and its results; the reasons for assuming so large a measure of responsibility, not only for the labor conditions in the plants, but also for the social and moral surroundings of the employees; to what extent it would be desirable to give the employees an insight into the operations of the company and a voice in the determination of working conditions and his ideas toward private philanthropies, stating that he had little use for charities.

May Discharge Employee for Belonging to Union

Supreme Court Holds Kansas Coercion Law Invalid— Thirteen Other States Affected

WASHINGTON, D. C., Jan. 26—That an employer may refuse to employ and may discharge a man for belonging to a union, was the decision of the Supreme Court, handed down yesterday. The Kansas coercion statute, so-called, making it unlawful for any individual or corporation to coerce or influence any person to enter into an agreement not to join or remain a member of a labor organization as a condition of such person securing or continuing in the employment of such individual or corporation, was annulled as unconstitutional by the Supreme Court.

The decision, which is regarded as of the first importance in the labor world, was announced by Justice Pitney. The case was that of T. B. Coppage, a superintendent of the St. Louis and San Francisco Railway at Scott, Kans., convicted of violating the law in threatening A. R. Hodge, a switchman, with discharge if he did not sign an agreement to withdraw from the Switchmen's Union.

The other laws which, according to Justice Day, are invalidated by the decision, are those of California, Colorado, Connecticut, Indiana, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Oklahoma, Oregon, Pennsylvania, Wisconsin and Porto Rico.

Badger Brass Sues for Infringement

CLEVELAND, O., Jan. 23—The Badger Brass Manufacturing Co., Kenosha, Wis., on January 21 brought suit in U. S. district court, Cleveland, against the Guide Motor Lamp Co., manufacturers of lamps and automobile accessories, charging infringement on a patent lamp socket. The complaint alleges the Guide company is using without authority the lamp socket for which Walter E. Christian was granted a patent May 27, 1912. R. H. Welles, treasurer of the Badger Brass Mfg. Co., brought the suit through his attorney, Albert H. Graves.

Seat Spring Patent Upheld in Detroit

DETROIT, MICH., Jan. 22—Judge Tuttle yesterday handed down a decision in favor of Theodor L. A. Adler and William G. Sullivan in their suit against the Jackson Cushion Spring Co., Jackson, Mich., charging infringement of Patent No. 991,187, covering spring construction for automobile seats. The court held that the patent was infringed.

The suit was brought May 21, 1913, Adler and Sullivan charging that the Jackson concern copied the invention of the patent 991,187 granted to them May 2, 1911, manufactured and sold it. The defense of the latter company was that the patent in question was antedated and hence void.

Charges Infringement of Tire Carrier Patent

NEW YORK CITY, Jan. 25—The Garage Equipment Mfg. Co. has brought suit against the Charles Weiland Co., charging infringement of its Patent No. 46,360 covering a tire carrier design for automobiles.

The bill of complaint states that Grant F. Discher, Milwaukee, Wis., assigned his patent on this design to the Garage Equipment Mfg. Co., June 10, 1914, and that the latter company received a patent on it for 7 years from September 8, 1914. This company charges that the Weiland company seriously injured its business by making and selling large quantities of tire carriers containing the design of the patent both after the granting of the patent and before the filing of the bill of complaint in this suit. The Garage

Equipment Mfg. Co. alleges that the Weiland company is still securing large gains from the sale of these devices in spite of having been notified of infringement of the patent.

The Garage Equipment Mfg. Co. asks for a preliminary and a final injunction; that all of the alleged infringing devices now in the possession of the Weiland company be destroyed, or turned over to it for this purpose; that the court compel the Weiland company to make an accounting of the alleged profits from the sale of the device, and that such damages be tripled.

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CLEVELAND, O., Jan. 23—The Lindsay Auto Parts Co., Indianapolis, Ind., brought suit in U. S. district court, Cleveland, Thursday, January 21, against the Winton Motor Carriage Co., charging infringement of driving axle patents. The action asserts that patents were issued to Thomas J. Lindsay May 9, 1898, for a driving axle invention he assigned to William Harmon, then both assigned to the Lindsay Auto Parts Co. Losses to the extent of $3,000 have been suffered, according to the bill of complaint. Charles Martindale, attorney, Indianapolis, represents the complainant.

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$20,000 Verdict for Curtain-Holder Inventor

DETROIT, MICH., Jan. 23—Yesterday a jury in Judge Mayne's Wayne County circuit court awarded $20,000 damages to W. A. Paul, an inventor of a curtain holder for inside curtains on automobiles, against J. N. Collins, J. A. Bennett and the Novelty Leather Works, all of Jackson, Mich.

It was claimed by Paul that prior to July 1, 1912, he conceived and invented "a certain curtain holder pertaining to the use of inside curtains for automobiles," that he made a working model, showed it and the plans to Collins, and made actual demonstrations for the purpose of securing the financial aid of Collins' company, the Novelty Leather Works, to be able to get letters patent and market the device. It was agreed, so Paul claimed, that in consideration for allowing the Novelty Leather Works to make and sell his invention he was to receive 25 per cent. of the receipts of the business derived from his invention. He also claimed that Collins and Bennett conspired to defraud him out of his rights, and that patent No. 1,066,448 filed by Collins July 22, 1912, and granted to him July 1, 1913, was his—Paul's—invention.

Plaintiff Paul asked for $50,000 damages. The jury allowed $4,500 as back royalties and $15,500 as future royalties.

The case will be appealed, the attorneys for Collins and Bennett claiming that the circuit court has no jurisdiction, and that the case should have been heard in the United States courts.

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Army Truck Bill Is Passed

WASHINGTON, D. C., Jan. 23—The army appropriation bill, carrying $101,000,000 was passed by the House today. The bill which carries funds for the maintenance of all branches of the army during the coming fiscal year, includes $50,000 for armored motor cars.

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Debate Over Cars in Indian Bill

WASHINGTON, D. C., Jan. 23—A provision in the Indian appropriation bill appropriating $15,000 for the purchase of twenty motor cars for the use of superintendents, farmers, physicians, field matrons and other employes of the Indian field service, aroused a big debate in the house of representatives. Many members were opposed to the appropriation, while others urged it. It was finally decided to leave the provision in the bill.

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New York Automobile Bond Bill Up Again

ALBANY, N. Y., Jan. 24—A bill has been introduced by Assemblyman M. D. Perlman, providing that no motor vehicle shall be operated until the owner has filed a bond, approved by the secretary of state in the sum of $5,000 for the payment of any judgments for damages caused to persons or property by the automobile.

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To Raise Speed Limit in Delaware

WILMINGTON, DEL., Jan. 25—A bill is pending before the Delaware Legislature—it passed the house without opposition—increasing the motor speed limit for Delaware outside of the cities and towns from 20 to 25 miles an hour and in the towns from 12 to 15. A bill is pending in the Senate to require all vehicles to carry lights at night. Both houses have passed an act permitting the secretary of state to use a rubber stamp in signing his name to automobile licenses.

Prior Art Defense in Kardo Suit

Chalmers Representative Alleges Previous Use of Bearing and Axle Practice

CLEVELAND, O., Jan. 26—In the action of the American Ball Bearing Co. against Edward B. Finch, representing the Chalmers Motor Co., before Judge Clarke today, prior art testimony was offered by the defense to show that Chalmers ball bearing and front axle practice were in use previous to the patent grant on which the complainant alleges infringement. Final argument will be heard and a decision probably rendered tomorrow. The witnesses called today included Walter C. Baker, President of the American Ball Bearing Co.; Howard E. Coffin, Vice-President of the Hudson Motor Car Co., Herbert N. Rich, B. I. Tuttle, B. B. Neuteboom, Consulting Engineer of Detroit, and James G. Heaslet, Vice-President of the Studebaker Corp.; F. C. Hinkley, of the Chalmers Co. was present.

Yesterday evidence was taken reviewing that presented at the previous hearings. The American Ball Bearing Co. brought suit March 5, 1913, alleging in its bill of complaint that Edward B. Finch as a representative of the Chalmers Motor Co. and the Metal Products Co., urged and induced the use of anti-friction bearings in Chalmers motor car construction, in alleged infringement of patents issued to Walter C. Baker and assigned to the American Ball Bearing Co. The patent is No. 753,820, and was issued February 24, 1902, according to the complaint, and has to do with the efficiency of the front axle. Licensees of the American Ball Bearing Co. include the Lozier Motor Co., Pierce-Arrow Motor Car Co. and the Baker Motor Vehicle Co., according to the bill of complaint and an offer was made the defendant, on behalf of the Chalmers Motor Co., to adopt the patent, the papers allege.

The action filed June 25, 1913, by the Kardo Co., substituting for the American Ball Bearing Co., against Henry J. Adams, former representative and at that time dealing as the Reo Motor Sales Co., is on the U. S. district court calendar for hearing Wednesday. The same attorneys will appear in this case, it is probable. The Kardo Co., following up the American Ball Bearing Co.'s suit, alleged infringement of Patent No. 792,690, issued to Alanson P. Brush, of Detroit, for bevel-gear driving and compensating mechanism. The bill of complaint established that Brush assigned to the Baker Motor Vehicle Co. and the Baker Motor Vehicle Co. assigned to the American Ball Bearing Co., with the patents of the latter corporation now under the control of the Kardo Co. Transfer of the suit was made to the Kardo Co. October 3, 1914.

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Michigan to Tax Weight $.25 Per 100?

LANSING, MICH., Jan. 26—An automobile tax bill was introduced last night in the House of Representatives by Representative Newel Smith which provides in addition to a tax of 25 cents per horsepower also a tax of 25 cents for every 100 pounds of weight.

The reason for adding a tax on the weight of motor cars is because many low-powered cars are much heavier than many high-powered vehicles, and the latter do not wear out the roads as much as the former. Furthermore, this system will also provide a more equitable taxation and trucks and other commercial vehicles will have to pay a more just proportion considering that they wear the roads more than the passenger cars.

It is estimated that if the measure is adopted it will mean a revenue of from $700,000 to $850,000 annually, which is to be used exclusively for building, improving and maintaining the state's roads and highways. A sum not to be over 5 per cent. of the total is to be set aside for salaries and expenses of the highway department.

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LOS ANGELES, CAL., Jan. 18—At a meeting held here today, attended by representatives of the state motor vehicle department, the Automobile Club of Southern California and officers of the traffic division of the local police department, regulations governing motorists visiting in Southern California were drawn up.

Motorists from outside states carrying 1915 license plates on their cars will receive the same consideration as autoists carrying the latest California number plates, notwithstanding the price paid for the plate nor in which state it was purchased.

Kelly-Springfield Gets War Order

Canadian Government Orders 150 of 3 1-5-Ton Trucks— Also 30 a Month During War

NEW YORK CITY, Jan. 25—After practically 2 months of investigation and delay, the Canadian government has placed an order of 150 trucks for war purposes with the Kelly-Springfield Motor Truck Co., Springfield, O. J. L. Geddes, president of the company, states that the trucks are of the 3 1-2-ton type. He also states that the order calls for thirty trucks a month until the war is ended.

Although the trucks are to be made at Springfield, the Kelly company has offered to take over an assembly plant in Canada to complete the order.

Porter to Use High-Speed Knight

NEW YORK CITY, Jan. 27—Finley R. Porter, who recently founded the Finley Robertson Porter Co. to manufacture the F. R. P. car, a speed creation, announces that his company will be located in Indianapolis, Ind., where it will bring out a special small racing car under the name F. R. P., using a 3 3-4 by 6 1-8 inch four-cylinder Knight motor of 207 cubic inches piston displacement and capable of 3,500 r.p.m.

Mr. Porter, who, as chief engineer of the Mercer company, has had great experience in the racing field, states that it is the intention of the company to enter this car in practically every sanctioned contest during the coming year.

The motor will develop, it is expected, 130 brake horsepower and the car will be capable of 105 miles per hour. Other specifications are 108-inch wheelbase; V radiator; pump cooling; Bosch magneto; weight about 1,900 pounds; cone clutch; four-speed selective gearset located amidship; bevel drive; drop frame; semi-elliptic springs all around with the rear end of the rear springs taking the drive; torque rod but no radius rods; and 34 by 4-inch Rudge-Whitworth wire wheels.

The same general construction as used in the car formerly announced is followed, the same high class steel being used in the chassis.

Designing New Gramm Truck Model

LIMA, O., Jan. 23—Preliminary plans have been announced to local stockholders of the Gramm Motor Truck Co., for the reorganization by the Geiger-Jones Co., of Canton, O., which was underwriter for the original issue of preferred stock, and which has just taken over the common stock of John North Willys.

The plant will be, it is understood, under the personal management of representatives of the Geiger-Jones financial house. Under the new plan the Garford plant at Elyria, O., will be merged with the Gramm plant at Lima, where both Gramm and Garford trucks will be made.

The Gramm company is now capitalized at $1,250,000, with $500,000 of this preferred, a large portion of which is still held in the treasury. The capitalization of both common and preferred, it is said, will be reduced 50 to 60 per cent. consent already having been secured by the reorganization committee from two-thirds of present stockholders.

The common stock has never paid a dividend, but the preferred requirements have been paid and all mortgage indebtedness to local banks, which originally financed the big plant and real estate, have been paid off.

J. N. Garver, representing the Geiger-Jones Co., states that designers are now at work designing an entirely new motor truck to be manufactured as soon as the reorganization of the company is completed.

Monitor Eight-Cylinder Car Appears

COLUMBUS, O., Jan. 26—The Cummins Auto Sales Co., North Fourth street, Columbus, O., has entered the field as a manufacturer of an eight-cylinder automobile. The first car is about completed and will be shown for the first time at the Columbus Automobile Show, January 30 to February 6. The name will be the Monitor. The company is also preparing to place on the market the Monitor Jr., a four-cylinder car to sell at $675.

The eight-cylinder car's weight will not exceed 2600 pounds, according to the statement of the builders. It will have Timken axles both in front and the rear and will develop 35 horse power. The motor is cast in two unit blocks set at 90 degrees in crank case. It will have a unit power plant with sliding gear transmission. It will be equipped with a self-starter and generator.

The wheelbase is 110 inches and the tires will be 33 by 4, with demountable rims. The cooling system will be something unique. It will have a deeper radiator and two separate pumps, one at the bottom of each block of the motor. There will be four connections with the radiator. The body will be of the approved stream line style and will be especially roomy. Five passengers will be carried with comfort. The front springs will be semi-elliptical and the rear springs will be three-quarter underslung elliptical. Spicer universal joints will be used.

It will have a one-man top with Jiffy curtains, crown fenders and the running board will be aluminum bound, covered with linoleum. It will have left-drive and center-control. The upholstering will be full leather. The body will be royal blue with black running gears, fenders and hood. The price is $1,275.

Automobile Securities Quotations

NEW YORK CITY, Jan. 26—The general tone throughout the automobile and allied securities market was steady during the past week, and most of the changes recorded were slight. One of the features of the week's trading was the rise of Kelly-Springfield tire stocks, the common gaining 15, first preferred 3 and second preferred 5. Other gains recorded during the week were: Firestone Tire common 5; General Motors common 3; U. S. Rubber preferred 2; and Willys-Overland common 4 1-2. Practically all the declines were small, being largely due to market fluctuations.

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Net Ch'ges
Ajax-Grieb Rubber Co. com	195	..	250	..	..
Ajax-Grieb Rubber Co. pfd	98	101	100	..	..
Aluminum Castings pfd	97	100	95	100	..
J. I. Case pfd	..	..	75	85	..
Chalmers Motor Co. com	..	92	..	96	..
Chalmers Motor Co. pfd	93	95	90	93½	..
Electric Storage Battery Co	..	..	48½	49½	..
Firestone Tire & Rubber Co. com	244	252	370	376	+5
Firestone Tire & Rubber Co. pfd	105	..	109	111	..
General Motors Co. com	45	47	90	91½	+3
General Motors Co. pfd	84	85½	93	94½	—1
B. F. Goodrich Co. com	22	22½	30	30½	—1
B. F. Goodrich Co. pfd	86½	87½	96	97	+ ½
Goodyear Tire & Rubber Co. com	235	235	194	196	..
Goodyear Tire & Rubber Co. pfd	98	100	102	103	+1
Gray & Davis, Inc., pfd	90	100	..	..	..
International Motor Co. com	..	5	..	1	..
International Motor Co. pfd	..	15	..	10	..
Kelly-Springfield Tire Co. com	52	54	93	94	+15
Kelly-Springfield Tire Co. 1st pfd	121	125	82	83	+3
Kelly-Springfield Tire Co. 2d pfd	..	..	105	107	+5
Maxwell Motor Co. com	4	5	16½	17½	—1½
Maxwell Motor Co. 1st pfd	27½	28½	53	54	— ½
Maxwell Motor Co. 2d pfd	8	9	21	21	..
Miller Rubber Co. com	..	..	158	165	..
Miller Rubber Co. pfd	..	..	101	103	..
New Departure Mfg. Co. com	120	125	..	120	..
New Departure Mfg. Co. pfd	102	104	101	..	..
Packard Motor Car Co. com	..	..	..	100	..
Packard Motor Car Co. pfd	95	100	93	..	..
Peerless Motor Car Co. com	15	25	15	20	..
Peerless Motor Car Co. pfd	75	80	..	55	..
Portage Rubber Co. com	..	40	30	36	..
Portage Rubber Co. pfd	..	90	80	85	..
*Reo Motor Truck Co	6½	7½	12	12¾	+ ¾
*Reo Motor Car Co	14⅞	15⅜	25	25¾	..
Splitdorf Electric Co. pfd	40	50	..	..	—1½
Stewart-Warner Speed Corp. com	52	†53	51	†52½	..
Stewart-Warner Speed Corp. pfd	94	†98	99	†102	..
Studebaker Corporation com	26	26½	42	43	+1
Studebaker Corporation pfd	76¾	77¼	94	95	..
Swinehart Tire & Rubber Co	69	71	69	71	..
Texas Company	..	..	133	134	..
U. S. Rubber Co. com	62	62½	57	58	—1
U. S. Rubber Co. pfd	102½	103¼	104	105	+2
Vacuum Oil Co	213	216	199	201	—1
White Company pfd	105	110	108	110	..
Willys-Overland Co. com	64	66	91½	92	+4½
Willys-Overland Co. pfd	92	95	93	95	..

*Par value $10; all others $100 par value.
†Ex. dividend.

CHICAGO, ILL., Jan. 23—The Stewart-Warner Speedometer Corp. has declared the regular quarterly dividend of 1 1-2 per cent. on its common stock and 1 3-4 per cent. on its preferred stock, both payable February 1, to holders of record January 23.

DETROIT, MICH., Jan. 25—The revised traffic ordinance was adopted at last week's common council meeting and will go into effect March 1. Its principal new provision is that all vehicles, whether automobiles or horsedrawn, must carry a tail light.

Market Reports for the Week

NEW YORK CITY, Jan. 27—Few changes occurred in this week's market reports. Most of the materials remained constant. Tin went up $1.25 per 100 pounds, with small demand and resale lots at concessions. On Friday and Saturday, lead rose to $3.70, but immediately dropped to the opening price, $3.67 1-2, which was held until the close. Electrolytic copper dropped $0.00 1-2 per pound, and the Lake product rose $0.00 23-40. On Tuesday, electrolytic was offered more freely in first and second hands. There is almost no demand for home consumption. Antimony rose $0.01, closing at $0.16. This metal has had a gradual rise within the last few weeks. Rubber was a little more active this week. Manufacturers manifested a little more interest in the market than for some time past, according to reports current, though there seemed to be little doing among the dealers. The market retained a steady tone for fine Up-River Para, which closed at $0.62. No changes occurred in the oil and lubricants markets.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.15	.15½	.16	.16	.16	.16	+.01
Beams & Channels, 100 lbs.....	1.21	1.21	1.21	1.21	1.21	1.21	.....
Bessemer Steel, ton.	18.50	18.50	18.50	18.50	18.50	18.50	.....
Copper, Elec., lb..	.13¾	.14	.13⅞	.13½	.14¼	.14¼	—.00½
Copper, Lake, lb..	.13⅝	.13⅞	.13⅞	.13½	.14⅜	.14⅜	+.60²³⁄₄₀
Cottonseed Oil, bbl	6.60	6.60	6.60	6.60	6.70	6.70	+.10
Cyanide Potash, lb.	.21	.21	.21	.21	.21	.21	.....
Fish Oil, Menhaden, Brown	.41	.41	.41	.41	.41	.41	.....
Gasoline, Auto, bbl.	.12	.12	.12	.12	.12	.12	.....
Lard Oil, prime...	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.....	3.67½	3.67½	3.70	3.70	3.67½	3.67½	.....
Linseed Oil.....	.60	.60	.60	.60	.60	.60	.....
Open-Hearth Steel, ton	18.50	18.50	18.50	18.50	18.50	18.50	.....
Petroleum, bbl., Kans., crude	.55	.55	.55	.55	.55	.55	.....
Petroleum, bbl., Pa., crude	1.50	1.50	1.50	1.50	1.50	1.50	.....
Rapeseed Oil, refined	.71	.71	.71	.71	.71	.71	.....
Rubber, Fine Up-River, Para.....	.62	.60	.60	.62	.62	.62	.....
Silk, raw, Ital.....	..	3.90	..	..	3.90	3.90	.....
Silk, raw, Japan...	..	3.52½	..	..	3.52½	3.50	—.02½
Sulphuric Acid, 60 Baume.....	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.....	34.25	34.75	34.78	35.00	35.75	35.50	+1.25
Tire Scrap.....	.05	.05	.05	.05	.05	.05	.....

Racine Rubber Profits $570,000

RACINE, WIS., Jan. 21—At the annual meeting of the stockholders of the Racine Rubber Co., it was announced that during the year ending December 31, 1914, the total earnings amounted to $570,000 and the total sales had been $2,400,000. At the present time the company has outstanding $310,000 in 7 per cent. cumulative preferred stock and $733,500 in common stock and has a surplus of $180,000. During this year the company will employ 500 to 600 men, the annual payroll amounting to more than $300,000.

According to officers of the company orders already on the books indicate that during 1915 sales will aggregate near $3,500,000. All the officers have been re-elected, they being. G. B. Wilson, president and general manager; H. L. McClaren, vice-president and general sales manager; L. T. Vance, general factory manager and Stuart Webster, secretary-treasurer.

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Republic Truck Capital Increased $200,000

ALMA, MICH., Jan. 21—At a meeting of the stockholders of the Republic Motor Truck Co., it was voted unanimously to increase the capital stock from $50,000 to $250,000. Although the Republic company added to its original plant last year it is likely that a further extension will be made during the present year. An average of twelve trucks are made daily and it is hoped to increase this output gradually.

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IN the Rostrum for January 21, page 165, it is stated that the ordinary 6-volt, 16-candlepower tungsten-filament head lamp consumes 240 watts. This is incorrect, the watt consumption being approximately 16 or 1 per candlepower as previously stated in the same paragraph. The formula for amperes when candlepower and voltage are known, which it was intended to give should read, for this type of lamp: amperes = watts-per-candlepower × candlepower ÷ voltage. With this lamp the result would be 2.66.

Large Rubber Shipments Coming

Lusitania Brings Over 200 Tons for Our Manufacturers — 1,000 More Tons Coming on Menominee

NEW YORK CITY, Jan. 23—The Lusitania, with 200 tons of plantation grades of crude rubber, docked in this city today. Of this amount, 100 tons are consigned to the United States Rubber Co. and 90 tons to the B. F. Goodrich Co. B. G. Work, president of the Goodrich company, returned from London on the boat.

In a report made by Mr. Work at the Union League, he explained the conditions under which Great Britain lifted her embargo on rubber on January 9 and also stated that American exporters are now upon their honor strictly to observe the regulations agreed to in order that no further embarrassing trade difficulties with Great Britain may be precipitated. He also stated that in a week or so exportations amounting to $250,000 daily will be released and 250,000 idle laborers will be enabled to return to their work. A large number of permits for shipping crude rubber have been issued by the British Government, said Mr. Work. Cargoes will be allowed to go direct from here to France and Russia.

The Menominee, which set sail last week from Liverpool for this city, is bringing an additional 1,000 tons of plantation rubber, of which 350 are for the United States Rubber Co. The consignees for the balance are not obtainable here at the moment. The Franconia will be the next steamer after the Menominee on which shipments of crude rubber will be made. It is learned that the United States Rubber Co. will have a shipment on that boat also.

Akron despatches say that the officials of the rubber manufacturing companies there have announced that full forces of men will be put to work shortly and that in the near future it is expected that employment will be given to nearly all the men who are idle today. The Goodrich company states that 2,000 additional men will be put to work by April 1.

Crude rubber in Brazil shows a declining tendency, as the result of the activity of importers and manufacturers in the United States in increasing their stocks of plantation grades from London. At Manaos there are 1,000 tons and at Para 1,100 tons available for purchase, the rubber being held. There is a light demand for this rubber.

The United States Rubber Co. has notified the trade that there will be no change in the prices of its products until March 1, unless competitive conditions or some other striking developments should make such action necessary.

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Federal Rubber Capital Increased $1,000,000

MILWAUKEE, WIS., Jan. 23—The Federal Rubber Mfg. Co., of Milwaukee, with factories at Cudahy, Milwaukee county, on January 20 filed an amendment to its articles of incorporation, increasing the capital stock from $2,000,000 to $3,000,000. The additional issue of $1,000,000 is to be used for the accommodation of the growth of the business.

Byron C. Dowse, president of the company, explained that the company has under way an extension and improvement scheme involving $500,000 or more. When this is completed by July 1, the capacity of the tire works will be doubled. The plant at present is operating 20 hours a day and the working force numbers 1,200. The force is gradually being increased and is expected to reach 1,600 when the latest factory addition, just put under way, is finished.

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Republic Rubber May Issue $2,500,000 Preferred

YOUNGSTOWN, O., Jan. 23—At its annual meeting January 25 the Republic Rubber Co., this city, will place before its stockholders a plan to issue $2,500,000 preferred stock, with the proceeds of which the preferred stock now outstanding will be redeemed. The new issue of $2,500,000 to retire old stock will bear the same rate of interest as the stock to be redeemed, but will have a longer maturity term attached to it, likely 15 years. It is stated that due to growing business it will be necessary in the near future to increase the size of the plant.

N. Y. Fire Marshal Office Abolished

State Assembly Passes Bill Dropping Obnoxious Garage Regulations

NEW YORK CITY, Jan. 26—The office of New York state fire marshal and the set of garage regulations, which the present incumbent, T. J. Ahearn, promulgated, have been abolished. The measure which brought about the abolishment was introduced by Majority Leader Hinman and was passed through the Assembly last night by a vote of 93 to 38, the Republicans voting solid and carrying the Progressives with them. The measure will go to the Senate next week, where it will probably receive the same action given it by the Assembly.

The abolition of the office brings to a successful end the fight which has been waged by the Automobile Trade Assn. of New York State, headed by R. H. Johnston, of the White Co., and attorney Chas. Thaddeus Terry, and secretary C. A. Stewart. At the request of this association the rules which applied to all cities in New York State with a population of 1,000,000 and over, were suspended indefinitely, pending an investigation and a proposal to redraft them to make them feasible and fair.

Bosch Offers $1,900 for Race Prizes

NEW YORK CITY, Jan. 26—The Bosch Magneto Co., this city, offers $1,900 for the Vanderbilt Cup and Grand Prize races, to be held on Washington's Birthday and February 27, respectively.

The distribution of the Bosch prizes is as follows: To the winner of the Grand Prize race $500; to second, $150; and to third, $100. The only condition to these prizes is that the driver in each instance use a Bosch magneto for ignition purposes during the race. In the case of the Vanderbilt Cup race, the winner of the first prize receives $300; second receives $150, and third $100. The condition is the same as in the Grand Prize race.

A second set of prizes has been arranged for the drivers in case they use during the race Bosch plugs in addition to Bosch magnetos. In each case if his ignition equipment is completely Bosch, the first three winners are to be awarded an additional $100.

New Enamel Process Saves Time

NEW YORK CITY, Jan. 23—The Fickling Enameling Corp., Long Island City, has started operations in its new enameling plant and has introduced methods which are stated to save considerable time in the production of a hard, durable coat.

The work is done under what is known as the Radio process. Humidified, water-washed air is pumped into a series of large ovens by a fan blower and superheated by coming into contact with radiators. The ovens are operated under low-heat temperature conditions and, according to officials of the company, the varnish will dry in 3 hours, whereas with the ordinary method it takes 3 days with the use of heated air. It is stated also that each coat is dried all the way through instead of merely on the surface, and for that reason there is no danger of discoloration through sweating. By this method an entire automobile is japanned in 3 days, the fenders and other small parts being enamelled.

Business Good at Detroit Show

DETROIT, MICH., Jan. 23—The Detroit Automobile Show came to a close Saturday night with more cars sold than ever before in the history of the show. The business of the week was also good from the point of view of agencies established. Practically every hotel in the city was filled during the show week and a good percentage of the visitors were dealers from all over the United States.

A feature of the week was the number of banquets and conventions held, a brief summary of these being as follows:

The King Motor Car Co. gave its annual dinner to the parts and accessory manufacturers who furnish either parts or accessories for King cars. Including the officials of the company, there were 135 guests. Artemas Ward, Sr., presented each of the guests with a book on food which retails for $10.

At the Tuller a banquet was given by the Olds Motor Works, Lansing, Mich., attended by more than fifty members of the organization.

The Edelweiss cafe was the rendezvous for the banquet given by the Paige-Detroit Motor Car Co. to its dealers from the Middle West, more than 150 being present. A feature of the evening was the Paige Movies Show.

From January 20 to 22 the annual dealers' convention of the Federal Motor Truck Co. took place. More than 150 attended and some came from all the states in the Union. The banquet was served at the Ponchartrain.

Over 600 at Overland Dinner

CHICAGO, ILL., Jan. 26—The show week dinner of the Overland company, held tonight at the La Salle was a record-breaker in the way of attendance, there being more than 600 guests, most of them dealers. In the way of a novelty the company had a Wild West entertainment before the dinner, the eighteenth floor of the hotel being converted into a Western mining camp, with gambling houses, saloon, dance hall and jail. Each guest was furnished with $500 in phony money with which to gamble and each wore a sombrero and red bandanna handkerchief.

Champion Plug Salesmen Hold Convention

TOLEDO, O., Jan. 23—The annual salesmen convention of the Champion Spark Plug Co., this city, was held at the factory January 19, 20 and 21, the salesmen carrying out a regular detailed program during the 3 days, Monday and Tuesday being devoted to business discussions while on Thursday the company entertained the salesmen in Detroit, where they inspected some of the large automobile plants as well as attending the Detroit show.

Rayfield Organization Meets in Convention

CHICAGO, ILL., Jan. 22—The annual convention of the Rayfield carbureter organization was held January 21 and 22 at the Findeisen & Kropf Mfg. Co. plant, here. The carbureter question was discussed in all its phases. The changes in the construction of motors and the fuel question were given due consideration, inasmuch as these two important factors in automobile construction are closely allied with the carbureter.

Thursday evening the men were entertained at a banquet given by the firm in the dining room of the Chicago Motor Club. Friday evening the entire party was taken to the Cort Theater.

Continental Motor to Increase Plant

MUSKEGON, MICH., Jan. 25—Several temporary frame buildings are to be added to the local plant of the Continental Motor Mfg. Co., and when they will all be completed it is expected that several hundred men will be added to the present working force which now numbers 1,200 men. The first addition to be made is a machine shop, 60 by 100 feet and about 100 men will be employed in it.

DETROIT, MICH., Jan. 25—While officials of the Continental Motor Mfg. Co., did not care at this time to go into the details of the proposed enlargement of their plant in Muskegon it was learned that such increase in business has come lately that in order to be able and take care of it day and night shifts are being employed in the Detroit plant. The total number of men was stated to be 1,600 of which 400 constitute the night force.

NEW YORK CITY, Jan. 26—There are more than 200 passenger cars and trucks listed in the Twelfth Annual Handbook just issued by the National Automobile Chamber of Cemmerce, this city. Copies may be secured from the offices of the N. A. C. C. upon receipt of $0.25 in stamps.

NEW YORK CITY, Jan. 26—Col. Charles Clifton, president, has appointed J. Walter Drake, sales manager of the Hupp Motor Car Co., a member of the Legislative Committee of the National Automobile Chamber of Commerce. The other members are: H. H. Rice, Waverley, chairman and J. I. Farley, Auburn.

HARTFORD, CONN., Jan. 26—The West Works of the Pope Mfg. Co. have been purchased by P. Garvan, Incorporated, a local paper house. The property has been appraised at $110,000 so that it is finally disposed of for approximately 73 per cent. of the assessed value. This sale disposes of all the property of the Pope company in this city and under the jurisdiction of Col. George Pope, the receiver, the main works on Capitol avenue having been sold recently to the Pratt & Whitney Co. for $300,000.

Factory Miscellany

ENDURANCE Tire Adds—The Endurance Tire & Rubber Co., New York City, has awarded a contract for the erection of two factory buildings, one 80 by 252 feet and the other 35 by 37 feet.

Bartlett Adds—The Bartlett Automobile Co., Stratford, Ontario, plans to construct a new factory, estimated to cost $50,000.

Beaver Co. Equipping—The Beaver State Motor Co., Gresham, Ore., is installing equipment, including a milling and boring machine. The improvements will cost about $25,000.

Royal Equipment Adds—The Royal Equipment Co., Bridgeport, Conn., manufacturer of brakes and other automobile specialties, will erect an additional factory, 60 by 90 feet, three stories and basement.

$100,000 Plant for Stewart-Warner—Plans have been prepared for the Stewart Warner Speedometer Co., Chicago, Ill., for a six-story factory, 77 by 125 ft., to be erected at Wolfram and Lincoln streets, at a cost of about $100,000.

Willard Adds $25,000 Plant—The Willard Storage Battery Co., Cleveland, O., has secured a building permit for the construction of a factory building on East One Hundred and Thirty-first street to cost about $25,000.

Detroit Electrical Plant Sold—The plant of the bankrupt Detroit Electrical Appliance Co., Detroit, Mich., which made the Deaco starters, has been sold by the Detroit Trust Co., at public auction for $24,350 to Lipson & Schmidt.

Tool Manufacturer in Cincinnati—The Parts Mfg. Co., Cincinnati, O., has been organized to manufacture interchangeable parts, tools and fixtures. It also specializes in the machining of automobile parts and production of repair parts for all cars.

French Battery's Chicago Factory Branch—The French Battery & Carbon Co., Madison, Wis., has established a direct factory branch in Chicago. The company is capitalized at $50,000 and the articles filed in Illinois give the Chicago interest at $1,500. F. M. Brown is president and C. T. Ellis secretary.

Locomobile Adds—The Locomobile Co. of America, Bridgeport, Conn., has taken on new manufacturing space by leasing an additional floor of the Bridgeport Engineering Co's building, and will employ between 150 and 200 additional hands. It is buying new machinery.

Briscoe Dealers at Factory—About seventy Wisconsin dealers handling the Briscoe car were the guests of the Briscoe Motor Co., Jackson, Mich., recently. They visited the factory, were given business talks by officials of the company, discussed business conditions in their territory, made suggestions for improving business.

New Overland Plant—The contract for the erection of a large addition to the Willys-Overland plant, Toledo, O., has been awarded. The building will be constructed of concrete, brick and steel and will be 1,000 feet long, 200 feet wide and three stories high. An order for 35,000 barrels of cement has been placed for the construction work.

The Automobile Calendar

Jan. 23-30.....Montreal, Que., Show, Allen Line Liverpool Bldgs., Montreal Automobile Trade Assn., T. C. Kirby, Mgr.
Jan. 23-30.....Portland, Ore., Show.
Jan. 23-30.....Chicago, Ill., Automobile Show, Coliseum and First Regiment Armory.
Jan. 25-30.....Fall River, Mass., Show.
Jan. 25-30.....Buffalo, N. Y., Show, Broadway Auditorium, Buffalo Automobile Dealers' Assn.
Jan. 30-Feb. 6....Columbus, O., Show, Memorial Hall, Columbus Auto Club and Columbus Auto Trades Assn.
Jan. 30-Feb. 6....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Automobile Trade Assn.
Feb.....Portland, Ore., Show; Portland Auto Trade Assn.
Feb.....Battle Creek, Mich., Show, Rathbun & Kraft Bldg.
Feb.....Toledo, O., Show, Toledo Auto Show Co.
Feb. 1-6.....Louisville, Ky., Show, Louisville Auto Dealers' Assn., First Regiment Armory.
Feb. 2-7.....Kalamazoo, Mich., Show, Armory.
Feb. 3-6.....Geneva, N. Y., Show.
Feb. 4-6.....Marinette, Wis., and Menominee, Mich., Show, Armory, Marinette, Twin City Auto. Assn. of Marinette.
Feb. 8-11.....Peoria, Ill., Show, Coliseum.
Feb. 8-13.....Toledo, O., Show, Terminal Bldg., Toledo Auto Shows Co., H. W. Blevins.
Feb. 8-14.....Kansas City, Mo., Show.
Feb. 8-14.....Troy, N. Y., Show, Troy Auto. Dealers' Assn.
Feb. 8-15.....Wilmington, Del., Show, Hotel duPont.
Feb. 9-12.....Eau Claire, Wis., Eau Claire Auto Dealers' Assn.
Feb. 9-12.....Peoria, Ill., Show, Peoria Auto & Motor Cycle Dealers.
Feb. 10-13.....Davenport, Ia., Show.
Feb. 15.....Fort Wayne, Ind., Show, Fort Wayne Auto Trade Assn.
Feb. 15-20.....Grand Rapids, Mich., Show, Klingman Furniture Exposition Bldg., Grand Rapids *Herald*; C. L. Merriman.
Feb. 15-20.....Omaha, Neb., Show, Auditorium, C. G. Powell.
Feb. 15-20.....Bridgeport, Conn., Show, State Armory; B. B. Sterber.
Feb. 16-18.....Bloomington, Ill., Show, Deere Bldg.
Feb. 18-20.....Racine, Wis., Show, Racine Automobile Dealers' Assn.
Feb. 22.....Newark, N. J., Light Car Club of N. J., Hillclimb at Teaneck.
Feb. 22.....San Francisco, Cal., Vanderbilt Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Feb. 22-25.....Allentown, Pa., Show.
Feb. 22-27.....New Haven, Conn., Show, Second Regiment Armory; W. N. Lindsay.
Feb. 22-28.....South Bethlehem, Pa., Show, Coliseum; J. L. Elliott.
Feb. 23-27.....York, Pa., Show, Coliseum Hall.
Feb. 23-27.....Syracuse, N. Y., Show, Arena, Syracuse Motor Vehicle Trade Assn.
Feb. 23-27.....Syracuse, N. Y., Show, Armory, Syracuse Auto Dealers' Assn.; H. T. Gardner, Mgr.
Feb. 23-27.....Ft. Dodge, Ia., Show, Armory, C. W. Tremain, Sec.
Feb. 25.....New York City, S. A. E., Metropolitan Sec. Meeting; Report of Research Committee on Kerosene Carbureters. Research Com. Report on Non-Electric Continuous-Torque Transmission.
Feb. 27.....San Francisco, Cal., Panama-Pacific Exposition, Grand Prize Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Mar. 1-5.....Wilkesbarre, Pa., Show. Vehicle Trades Assn.
Mar.....Benton Harbor, Mich., Show, St. Joseph and Benton Harbor, St. Joseph Garage, St. Joseph.
Mar. 3.....Albany, N. Y., Associated Garages of America, General Convention.
Mar. 4-6.....Springfield, Mass., Show; J. H. Graham.
Mar. 6-13.....Boston, Mass., Show, Mechanics Bldg., Boston Auto Dealers Assn., Boston Commercial Motor Veh. Assn.
Mar. 6-13.....New York City, Made In the U. S. A. Exhibition, Grand Central Palace.
Mar. 8-13.....Indianapolis, Ind., Annual Spring Opening, Indianapolis Auto Trade Assn.
Mar. 8-13.....Canton, O., Show, Auditorium, Stark Co. Auto Show and Electrical Exposition.
Mar. 8-13.....Des Moines, Ia., Show, C. G. Van Vliet.
Mar. 8-13.....Utica, N. Y., Utica Automobile Trade Assn.
Mar. 13-20.....Harrisburg, Pa., Show Arena, Harrisburg Dealers' Assn.
Mar. 14.....San Francisco, Cal., Panama-Pacific Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Mar. 17.....Venice, Cal., Cal. Grand Prix, 300-Mile Road Race.
April .....Calumet, Mich., Show, Coliseum.
April 3.....Paterson, N. J., Show, Auditorium, R. A. Mitchell.
May 17-18.....Boston, Mass., A. A. A. Annual Meeting.
May 29.....Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.
June 9.....Galesburg, Ill., Two-mile Track Meet.
June 16.....Chicago, Ill., Speedway, 500-Mile Race, Speedway Park Assn.
June 25.....Sioux City, Ia., Track Meet.
July 4-5.....Tacoma, Wash., Road Race.
Aug. 2-3.....San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.
Aug. 20-21.....Elgin, Ill., Road Race.
Sept. 20-25.....San Francisco, Cal., International Engineering Congress.

The Week in  the Industry

Motor Men in New Roles

CONNELL Goes to Milwaukee—H. L. Connell, for the past 2 years secretary and treasurer of the Detroit section of the Society of Automobile Engineers, has left for Milwaukee, Wis., where he will cooperate in establishing a motor car testing laboratory and will be a member of the engineering faculty of the Central Continuation School. Mr. Connell has been connected with the experimental and truck engineering departments of the Packard Motor Car Co., and was engineer of the Commerce Motor Car Co.

Bunker Resigns—E. F. Bunker has resigned his position with the Perfection Spring Company. His resignation takes effect February 1.

Sabourin Mgr.—The General Motors Truck Co. has established a direct factory branch in Tacoma, Wash., with G. A. Sabourin in charge.

Weibel Firestone Mgr.—H. Weibel, a Cincinnati man, has been appointed manager of the Cincinnati, O., branch of the Firestone Tire and Rubber Co.

Estep Makes Change—Ralph Estep, formerly with the Packard Motor Car Co., Detroit, Mich., has joined the Cheltenham Advertising Agency, New York City.

McFarland Joins Cole—J. S. McFarland, purchasing agent and assistant superintendent of the Ohio Carriage Co., Columbus, O., has joined the staff of the Cole Sales Co., Indianapolis.

Brown in Packard Engineering Dept.—G. C. Brown, formerly with the Buffalo Electric Vehicle Co., is now with the engineering department of the Packard Motor Car Co., Detroit, Mich.

Brier Seattle G. M. C. Manager—Bruce Brier, well-known in the Seattle automobile field, has been named sales manager for the G. M. C. trucks and has established offices at 1400 Broadway, Seattle, Wash.

Director of New Orleans Assn.—Ginder Abbott of the Abbott Automobile Co., New Orleans, La., agent for the Packard and Jeffery cars, has been elected a member of the board of directors of the Assn. of Commerce of that city.

Zettler Mgr.—Judge Hugo Wegener, who has represented the Kisselkar at Marshfield, Wis., for some time, has established a salesroom and garage and taken on the Grant agency. Frank Zettler has been appointed manager.

Anselm Makes Change—Roy W. Anselm, until January 1 president and general manager of the Anselm-Ganahl Motor Car Co., is now connected with the Kardell Motor Car Co., St. Louis, Mo., distributors for the Reo and Chevrolet cars.

St. Louis Assn. Elects.—The annual banquet and election of officers of the St. Louis Carriage, Wagon and Automobile Builders' Assn., St. Louis, Mo., was held this week and the following men were selected as officers: President, John Cook; Vice-president, Fred Heimburger; Secretary A. E. Spaete and Treasurer, Henry Uhlenhalt.

Peoria Club Elects—At the annual meeting this week of the Peoria Automobile Club, Peoria, Ill., new officers were elected for the ensuing year as follows: President, Valentine Jobst; vice-president, S. L. Nelson; secretary, W. A. Bunn, and treasurer, C. E. Ulrich.

Fussey Re-Elected—At the annual meeting of the stockholders of the Detroit Brass Works, Detroit, Mich., J. W. Fussey was re-elected president, A. L. Hanson, vice-president, E. B. Whitcomb, treasurer, G. C. Hall, secretary. These officers and E. D. Bronner and O. P. Benjamin, constitute the board of directors.

Change of Plans in Boston—There has been another change in the handling of the Garford and Willys Utility trucks in Boston, and the R. E. Taylor Co., that now has them as an agency proposition, has placed J. H. Cafferty of New York in charge as manager. They were handled first as an agency by the R & L Co. and later as a factory branch proposition.

Grand Rapids Assn. Elects—More than fifty of the Grand Rapids, Mich., automobile and accessory dealers, garage owners and tire repair men have organized the Grand Rapids Automobile and Accessory Dealers' Assn. W. D. Vandercar was elected president; Carl P. Palmer, vice-president; Earl R. Corbin, secretary and Floyd G. Withrow, treasurer.

Wright a Manufacturing Agent—D. A. Wright, who for several years past has been connected with the Yale & Towne Mfg. Co., New York City, as district manager in the West, has opened an office for himself as manufacturers' agent at 140 South Dearborn street, Chicago, Ill. Mr. Wright is specializing on labor-saving and pneumatic machinery, cranes, hoists and trolley systems.

Ryan Joins Detroit Lubricator Co.—James Ryan, who has had 12 years experience in the automobile and carbureter business as engineer and demonstrator, and who during the last 3 years was representative in Indianapolis, Ind., for the Rayfield carbureters, recently resigned to become associated with the Detroit Lubricator Co., Detroit, Mich., manufacturer of the Stewart carbureters.

Findlay Co. Elects—The Electrical Motor & Construction Co., Findlay, O., has voted to increase its capital stock from $15,000 to $30,000 and to construct at once an addition to its present location, a building 50 by 122 feet, two stories. Stock rooms and repair shops will be located in the second story. The new officers of the company are: F. E. Hurley, president; O. D. Donnell, vice-president and R. J. Berry secretary.

Tri-City Dealers Elect—At the annual meeting of the Tri-City Auto Dealers Assn., Rock Island, Ill., composed of dealers of Rock Island, Moline and Davenport, the following officers were elected for the ensuing year: President, G. F. Burmeister, Davenport, Iowa Auto and Tire Co.; vice-president, P. C. Peterson, Davenport, Peterson Auto Co.; secretary-treasurer, Ross Beede, Rock Island, Interstate Auto and Supply Co.

Clare Joins Chase Truck—W. A. Clare, formerly in the research department of the Burroughs Adding Machine Co. and later with the Service Recorder Co., in charge of motor transportation problems, has joined the ranks of the Chase Motor Truck Co., Syracuse, N. Y., and will have charge of the Dealers' Aid and Research Department, which was established by H. T. Boulden, who recently became general sales manager of the Chase company.

Garage and Dealers' Field

Baker Rim Makes N. Y. Lease—The Baker Rim Auto Supply Co. has leased space at 250 West Fifty-fourth street, New York City. The Regal Auto Painting Co. has also leased space in this building.

New Winton Detroit Quarters—A new sales room is to be erected on Woodward avenue, Detroit, Mich., between Medbury and Hendrie avenues for the Winton Motor Car Co. The new headquarters will consist of a two-story building, 71 by 212 feet.

Representing New Products—Clarence N. Peacock & Co., New York City, in addition to the Ames equalizing springs, has secured the distribution for the Standard Steel Spring Co., the S-M-H chain tool, the Clincher tire plow and the Boyce hand horn.

Apperson Pa. Quarters Established—W. Taylor, recently appointed wholesale distributor of the Apperson car in Eastern Pennsylvania, Southern New Jersey, Delaware and Maryland, has established his headquarters in the Abbott Bldg., Broad and Race streets, Philadelphia, Pa.

Frisco Fiat Agent Moves—Latham, Davis & Co., San Francisco, distributor of Fiat and Stutz cars, is now located in new quarters on upper Van Ness avenue. Hereafter this company will have J. P. Edwards as president, a new comer to the automobile trade of the Coast.

Larson's Permanent Broadway Branch—C. H. Larson, the Oldsmobile dealer in New York City, has arranged to have a permanent Broadway branch at 1800 Broadway, the store from which the Rauch & Lang electric cars are being moved to the combination electric car display store at Central Park West and Sixty-second street. Mr. Larson intends to move into the new branch about February 1.

Book on Lubrication—A new book on lubrication has been issued by the Platt & Washburn Refining Co., New York City. Beginning with a brief history of the discovery of oil and its various uses, the book gets down to specific information of interest to owners of automobiles, motorboats and motor trucks, with a list of "Lubrication Don'ts." The company found by comprehensive investigations that there are ten systems of lubrication employed in internal combustion engines. A detailed description of the ten systems follows, supplemented by charts in color.